The International Journal of
Orthodontia, Oral Surgery and Radiography

(All rights reserved)

VOL. XVIII ST. LOUIS, AUGUST, 1932 NO. 8

ORIGINAL ARTICLES

AN INTRODUCTION TO GROWTH OF THE HUMAN FACE FROM INFANCY TO ADULTHOOD*†

MILO HELLMAN, D.D.S., NEW YORK, N. Y.
Research Associate in Physical Anthropology, American Museum of Natural History, New York

OF ALL the specialists in medicine and dentistry, the orthodontist has the greatest opportunity to learn the development of the human face from direct observation. Patients are brought to him from early childhood and remain in his care for many years. Most of the growing is done by them while he ministers to their needs. The trouble is that the orthodontist becomes so absorbed in moving the teeth that he seems at times to forget the child. Of course, every orthodontist has photographs of his patients before treatment is begun. When the correction of malocclusion is completed, another photograph is taken and the face of the patient is again brought to his attention. He notices a change. However, since he has worked so diligently to bring about the desired change in position and relationship of the teeth, he is impressed with the idea that the orthodontic treatment is causally related to the modification of the face. After the treatment has been completed, the patient is dismissed and the matter comes to an end.

If, however, one undertakes to follow up a number of children for several years, it will be observed that similar changes also occur when they are treated for such occlusal disturbances as have no visible effect upon the face or when they are not treated at all. The question then arises, is there not something beside orthodontic treatment which may be accountable for the changes of children's faces? Children by a gradual process of development eventually become adults. In the course of development the entire individual increases in size and changes in proportion. Is not the same thing also true in the development of the

*Read by title (Growth Changes of Faces With Dentitions in Normal and Abnormal Occlusion) at the Second International Orthodontic Congress, London, England, July, 1931.

†Read in abstract form by William K. Gregory at the annual meeting of the American Association for the Advancement of Science (Section H), New Orleans, Louisiana, December 30, 1931.

face? It would seem then necessary to know first what happens in the course of growth that brings about those facial differences in an individual, before attributing the changes to the occlusal relations of the teeth.

Studies on the growth of the human face, however, involve many features of interest. The external skin covering the face, the fat pads giving it form and contour, the muscles giving it expression and those active in mastication, the supporting framework of bones, the air spaces within the bones, the teeth and the dental arches, each calls for special attention. To understand the growth changes of any of its parts, it is necessary to have a clear concept of those affecting the entire face.

It would seem, therefore, that from whatever angle an approach is made, certain fundamental aspects of growth as it concerns the face as a whole need first to be taken into account. For instance, it is quite obvious that when the human face, like many other parts in the human economy representing bulk, grows there is an increase of its dimensions in three planes. It grows in vertical height, transverse width, and anteroposterior depth. There are, however, some peculiarities about this growth. One is that when certain parts of the face increase in size externally, air spaces develop internally. For example, as the external dimensions of the nose increase, the bony nasal aperture enlarges. In this instance there is an increase in dimension, but there is a relative decrease in substance. Another peculiarity in the growth of the face is that with increase in size there is a change in proportion of the dimensions in height, width and depth. In this change the largest dimensions increase their size least and the smallest most.

Still another peculiarity is that an increase in the dimension of one part may be partly due to the growth of another part. Thus the increase in dimension of the total face height is due partly to the growth of the face and partly to the development of the dentition. It is quite obvious that at birth the mouth is toothless. When the maxilla and the mandible are brought into apposition in the toothless mouth, their alveolar processes touch each other. In subsequent growth the teeth make their appearance and arrange themselves in arch forms on the crests of each of the alveolar borders. There is then a wedging apart, so to speak, of the maxilla from the mandible to the extent of the combined height of the tooth crowns in the two dental arches. Increases in the vertical size of the total face are then due, not to growth of the jaw bones alone, but also to the appearance of the dentition between them.

DIMENSIONS OF THE FACE

From the very beginning, the largest dimension of the human face is that of its width. This is clearly shown by Schultz,[1] and Scammon and Calkins[2] in their studies on prenatal growth. In all subsequent growth there is an apparent effort of the dimensions in height and depth to catch up with those in width. This, though never accomplished, is closely approached. To attain this end, growth in the three planes becomes unequal with the result that increases in size are accompanied by changes in proportion. Thus, as the face grows larger, it becomes absolutely and relatively longer and deeper; the former exceeding the latter.

XUM

MEASUREMENTS OF GROWTH CHANGES

How are growth changes studied? Since growth is attained by increase in size, measurements of a growing part taken at certain intervals will show differences in dimension. In the study of growth changes, two kinds of measurements are used. One is the measurement of dimension, the other is the measurement of time. For measuring dimensions certain kinds of yardsticks will do. For measuring time different sorts of devices have to be used. On this account particular mention must be made of the time scale used to measure the changes of the face incident to growth. The calendar year, although useful for many purposes, is of little value in this connection. Whether it is due to the rough technic employed, which no doubt is in need of considerable refinement, or to the scant yearly growth increments, one is not so sure. The fact remains that when the records studied were arranged in yearly intervals, the differences of the averages in dimensions were not even three times the error of the difference. In other words, in my series there were no statistically "real" differences discoverable from year to year.

The scale which I established for this purpose[3] in 1926 is consequently based, not on calendar time, but rather on anatomic manifestations. The teeth, used as milestones, quite adequately indicate the distance covered by the growing face, as we shall presently see. The paleontologist long ago arrived at the conclusion that "the most constant and dominating element of the face is the gateway formed by the mouth and arching jaws to the 'primitive gut' or digestive tract" (Gregory[4]). Confirmatory evidence from comparative anatomy also indicates that "around this architectural centerpiece the higher facial designs gradually developed" (Gregory[4]). It is likewise known that the infant's face appears at first without teeth, that the development of the dentition is closely related to the growth of the jaw bones and that certain phases of tooth additions or tooth eliminations are found to be associated with certain facial growth manifestations. It is therefore quite safe to use the periods of tooth accession as a measure for increments of facial growth. There are, according to this scale, five principal periods or phases in the development of the dentition.* *First* (IA), when the infant begins to get teeth; *second* (IIA), when by the acquisition of the second deciduous molars the deciduous or milk dentition is completed; *third* (IIIA), when the permanent first molar is added on behind the deciduous dentition; *fourth* (IVA), when the permanent second molar is added on behind the first; and *finally* (VA), when by the addition of the third molar, or wisdom tooth, the adult dentition is completed.

There are also secondary divisions or subdivisions of these phases† which refer to the beginning phenomena of erupting the deciduous second molars (IC), to the beginning phenomena of erupting the first permanent molar, including the elimination of the deciduous incisors and the eruption of their permanent successors (IIC), to the time of elimination of deciduous canines and molar teeth and the acquisition of their successors (IIIB), to the beginning phenomena of erupting the second and third permanent molar teeth (IIIC, IVC). These were included for the purpose of determining whether there is more jaw growth be-

*They are indicated by Roman numerals from I to V followed by letter A.
†Indicated by the letters B and C following the Roman numerals.

fore, during or after the eruption of additional teeth. If the records of the individuals measured are sorted out according to this scheme, it is not difficult to ascertain the average and the standard deviation of the ages in each of these groups. Accordingly, the stages of tooth development, from IIA to VA inclusive, may also be expressed in terms of years (Table I).

TABLE I

SHOWING STAGES OF DENTAL DEVELOPMENT, NUMBER OF INDIVIDUAL MEASUREMENTS AND AGES AT WHICH STAGES OCCUR

STAGES	MALES			FEMALES		
	AGES			AGES		
	NO.	AVER.	S.D.	NO.	AVER.	S.D.
IIA*	17	5.53	1.52	19	5.53	0.94
IIC	13	7.69	1.94	15	6.67	0.60
IIIA	115	9.00	1.41	106	8.40	1.14
IIIB	114	10.91	1.35	154	10.52	1.37
IIIC	56	12.70	1.25	68	12.53	1.54
IVA	156	14.78	2.07	248	14.89	2.16
IVC	21	18.62	2.36	22	20.05	2.28
VA	29	20.83	2.07	29	22.38	2.23

No. = number Aver. = average S. D. = standard deviation

The letters appended to the Roman numeral indicate the following: A, complete presence of the four homologous teeth; B, shedding of deciduous teeth and eruption of their permanent successors; C, beginning of eruption of a molar tooth. Thus, IIA indicates the presence of deciduous second molars; IIIA, presence of permanent first molars; IVA, presence of permanent second molars; VA, presence of third molars. IIC indicates beginning of eruption of permanent first molars, IIIC eruption of permanent second molars and IVC of the third molars.

The evidence in support of the views presented was obtained from records of face measurements of patients in private practice. They are all of white extraction and born in the United States, most of them in New York City. The measurements of their facial dimensions were taken only once in some cases, but in the greatest number they were repeated from two to seven times at yearly intervals. In all, 1196 series of measurements were used in this study. Of these 526 are of males and 670 of females. The average ages of the individuals measured range from 5.5 to 22 years; i. e., from the time the milk teeth are all erupted (Stage IIA) to the time when they have been shed and the permanent dentition is fully developed (Stage VA). The instruments used are shown in Fig. 1. They are: the spreading calipers (A), the sliding calipers (C), and the head spanner (B). The parts measured are:

I. *Heights* (Sliding calipers used).

a. Total face, from nasion to menton.

b. Upper face, from nasion to the point of the gum papilla between the maxillary central incisors.

c. Lower face, from menton to the point of the gum papilla between the mandibular central incisors.

d. Dental (or interalveolar distance), from the point of the gum papilla between the maxillary central incisors to that between the mandibular central incisors.

e. Nasal, from the nasion to the base of the nose (infranasale).

XUM

f. Ramus, from gonion to the condyle on a horizontal line with the lowest point of the upper margin of tragus.

II. *Widths* (spreading calipers used).

a. Bizygomatic, between the two zygomata.

b. Bicondylar, between the condyles of the mandible which can be felt when the mouth is widely open.

c. Bigonial, from the mandibular angle on one side to that on the other.

d. Nasal, at the widest part of the alae nasi in relaxation. (Sliding calipers used.)

III. *Depths* (for these measurements the Todd head spanner was used).

a. Auriculo-nasion, from external auditory meatus to nasion in the sagittal plane.

b. Auriculo-prosthion, from external auditory meatus to prosthion.

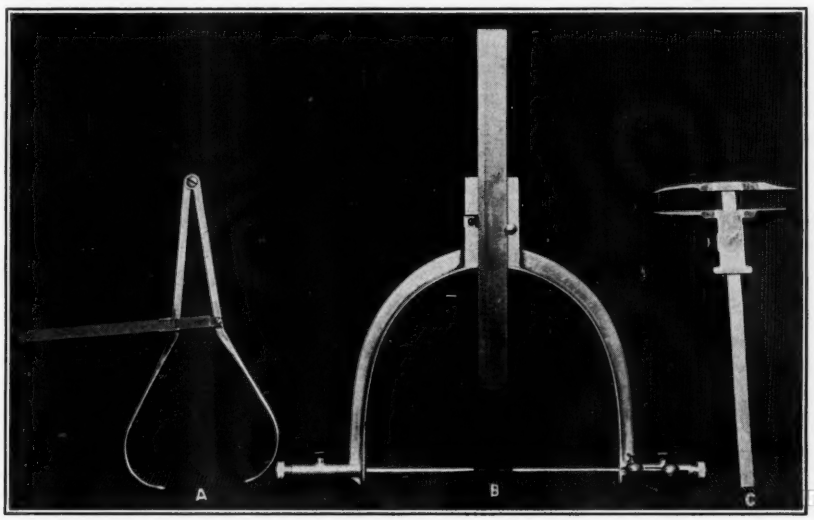


Fig. 1.—Anthropometric instruments used to measure the dimensions of the head and face: *A*, spreading caliper; *B*, Todd head spanner; *C*, sliding calipers.

c. Auriculo-infradentale, from external auditory meatus to infradentale (between mandibular central incisors at gum line).

d. Auriculo-menton, from external auditory meatus to menton.

e. Gonio-menton, from gonion to menton. (Spreading calipers used.)

The object of my study was really to learn more about the growth of the face as it takes place in the individual. But, on account of the many factors entering to complicate the matter, I thought it advisable to make first a mass study of the data, so as to gain a general perspective of the problem as a whole. To do this it is sufficient to use just the averages of the different dimensions. In this manner I shall attempt to bring into relief the gross changes which transform the face of the infant to that of the adult.

A general idea of the average age and the standard deviation at which the stages of dental development occur may be gained from the figures in Table I. In this table the different phases or stages are given, the number of individual measurements taken at each stage of dental development, the average and standard deviation of the ages at which these stages are reached by males and females.

The interesting feature in this table is that both males and females are of the same average age (5.5 years) after the deciduous dentition is completed (Stage IIA). In the stage following (IIC), when the permanent first molars are in the course of eruption, the males are a year behind the females. This is usually explained by the fact that females are more accelerated and get there more quickly. This is true as far as it goes; namely, through Stages III A, B and C. But note what follows. Stage IVA, the period when the permanent second molar teeth have completely erupted, is reached by the males at approximately the same average age as by the females. But what is still more curious is that in the following two stages, when the third molars are beginning and when they are completing their eruption, the females are, on the average, two years behind the males. The meaning of this sudden turn of events is not quite so clear. The explanation made above does not quite explain now. In so far as the third molar is concerned, the females seem to be slower getting it than the males. A vigorous study has now been undertaken for the purpose of finding an explanation, which will coincide with the facts.

In Tables II and III the stages, average ages and standard deviation of the greatest facial dimensions in height, width and depth of both males and females are shown. A point to be made is that, by absolute dimension, the face is widest from beginning to end, next to width in size is height, and last depth. Another

TABLE II

AVERAGE DIMENSIONS OF FACE IN HEIGHT, WIDTH, AND DEPTH FROM INFANCY TO ADULTHOOD. MALES

		HEIGHT (TOTAL FACE)			WIDTH (BIZYGOMATIC)			DEPTH (GONIOMENTON)		
STAGES	AVER. AGES	NO.	AVER.	S.D.	NO.	AVER.	S.D.	NO.	AVER.	S.D.
IIA	5.53	17	96.13	6.24	17	117.12	5.97	13	74.31	4.97
IIC	7.69	13	96.92	4.38	13	119.77	5.58	12	77.67	4.03
IIIA	9.00	114	102.62	5.43	114	121.31	5.07	69	81.25	5.31
IIIB	10.91	121	107.00	5.10	122	123.44	4.83	85	83.16	5.40
IIIC	12.70	57	109.79	5.82	56	126.47	5.08	53	87.19	5.46
IVA	14.78	154	114.34	6.66	154	130.36	6.06	104	89.92	5.82
IVC	18.62	21	120.57	5.97	21	137.19	4.65	19	95.67	5.04
VA	20.67	29	122.34	6.37	29	139.79	6.09	27	97.79	7.26

TABLE III

AVERAGE DIMENSIONS OF FACE IN HEIGHT, WIDTH AND DEPTH FROM INFANCY TO ADULTHOOD. FEMALES

		HEIGHT (TOTAL FACE)			WIDTH (BIZYGOMATIC)			DEPTH (GONIOMENTON)		
STAGES	AVER. AGES	NO.	AVER.	S.D.	NO.	AVER.	S.D.	NO.	AVER.	S.D.
IIA	5.53	19	91.58	3.53	19	113.26	4.98	11	72.73	4.54
IIC	6.67	15	94.67	4.01	15	116.80	4.12	9	77.22	1.99?
IIIA	8.40	107	98.26	4.95	107	119.29	4.89	72	79.38	5.23
IIIB	10.52	159	103.04	5.76	158	123.25	5.52	106	81.49	5.31
IIIC	12.53	68	106.09	6.12	68	125.44	4.56	47	83.24	4.92
IVA	14.89	251	110.91	5.91	252	128.06	4.65	145	86.25	5.34
IVC	20.05	22	116.52	6.24	22	132.00	4.30	19	93.16	5.55
VA	22.38	29	116.38	5.25	29	131.14	4.75	21	91.43	1.70

XUM

point is that as the face increases in these dimensions, it does so not uniformly either in time or in space. The final point is that if the dimensions in Tables II and III are compared, it will become quite obvious that there is a difference in the two sexes of similar measurements, all being larger in the males with only one exception. In the dimension of dental height (Table XXI) the females surpass the males. The differences, when expressed in relative dimensions as shown in Table IV A and B, are not uniform. They vary in different parts and at different ages. In certain parts at certain ages they are greater than in other parts and at other ages in the course of growth. But, on the whole, the tendency is that when adulthood is reached, the sex differences become more emphasized. These differences are particularly noticeable in auriculonasion depth, ramus height, and bigonial width. (Table IV B.)

TABLE IV

RELATIVE DIMENSIONS IN FEMALES AS COMPARED WITH THOSE IN MALES

STAGE	A			STAGE	B		
	BIZY.	TO. F. H.	GON. MEN.		AU. NA.	RA. HT.	BIGON.
IIA	96.70%	95.27%	97.87%	IIA	99.78%	93.74%	98.78%
IIC	97.52%	97.68%	99.42%	IIC	96.35%	90.96%	98.86%
IIIA	98.33%	95.75%	97.61%	IIIA	95.92%	92.88%	97.32%
IIIB	99.85%	96.30%	97.99%	IIIB	97.04%	89.98%	99.08%
IIIC	99.19%	96.63%	95.47%	IIIC	98.34%	93.78%	96.93%
IVA	98.24%	97.00%	95.92%	IVA	96.65%	91.69%	96.92%
IVC	96.22%	96.64%	97.38%	IVC	93.46%	90.25%	94.87%
VA	93.81%	95.13%	93.52%	VA	91.62%	80.84%	93.87%

Bizy. = bizygomatic width
T. F. H. = total face height
Gon. Men. = goniomenton depth

Au. Na. = auriculonasion depth
Ra. Ht. = ramus height
Bigon. = bigonial width

Differences in growth are also noticeable in the different face dimensions in each sex. In this manner growth becomes unequal, giving rise to changes in proportion between different parts. Changes in proportion may therefore be analyzed in different ways. By studying, for instance, the differences in growth of face height as they are related to those of face width (Table V), it is found that the relative dimension in height increases more than that in width from in-

TABLE V

RELATIVE AVERAGE DIMENSIONS OF FACE HEIGHT (TOTAL FACE) AND FACE WIDTH (BIZYGOMATIC)

STAGES	MALES			FEMALES		
	AGES	NO.	$\frac{\text{TO. F} \times 100}{\text{BIZYGO.}}$	AGES	NO.	$\frac{\text{TO. F} \times 100}{\text{BIZYGO.}}$
IIA	5.53	17	82.07%	5.53	19	80.86%
IIC	7.69	13	80.92%	6.67	15	81.05%
IIIA	9.00	114	84.59%	8.40	107	82.37%
IIIB	10.91	121	86.68%	10.52	159	83.60%
IIIC	12.70	57	86.81%	12.53	96	85.23%
IVA	14.78	154	87.71%	14.89	251	86.61%
IVC	18.62	21	87.88%	20.05	22	88.27%
VA	20.83	29	87.45%	22.38	29	88.74%

To. F = total face

Bizygo. = bizygomatic

fancy to adulthood. But the face height increases relatively more in females than in males. That is, the face of the female grows relatively longer than that of the male. When growth in depth is compared with that in width (Table VI),

TABLE VI

RELATIVE AVERAGE DIMENSIONS OF FACE DEPTH (GONIOMENTON) AND FACE WIDTH (BIZYGOMATIC)

STAGES	MALES			FEMALES		
	AGES	NO.	$\frac{\text{G M} \times 100}{\text{BIZYGO.}}$	AGES	NO.	$\frac{\text{G M} \times 100}{\text{BIZYGO.}}$
IIA	5.53	13	63.44%	5.53	11	64.22%
IIC	7.69	12	64.08%	6.67	9	66.11%
IIIA	9.00	69	66.98%	8.40	72	66.54%
IIIB	10.91	85	67.37%	10.52	106	66.12%
IIIC	12.70	53	68.93%	12.53	47	66.80%
IVA	14.78	104	68.98%	14.89	145	67.35%
IVC	18.62	19	69.74%	20.05	19	70.58%
VA	20.83	27	69.95%	22.38	21	69.93%

G M = goniomenton Bizygo. = bizygomatic

it becomes quite clear that the face also increases in this respect more than in width. But the differences between the sexes are somewhat reversed. That is, the face of the male grows in its relative depth slightly more than that of the female.

Comparisons made between the face and the brain case also bring out some interesting growth changes. For instance (Table VII), the relative total height

TABLE VII

RELATIVE AVERAGE DIMENSIONS OF TOTAL FACE AND AURICULAR HEIGHTS

STAGES	MALES			FEMALES		
	AGES	NO.	$\frac{\text{T F} \times 100}{\text{AUR. HT.}}$	AGES	NO.	$\frac{\text{T F} \times 100}{\text{AUR. HT.}}$
IIA	5.53	17	75.00%	5.53	19	73.14%
IIC	7.69	13	74.69%	6.67	15	73.96%
IIIA	9.00	114	77.30%	8.40	107	77.08%
IIIB	10.91	121	80.86%	10.52	159	80.13%
IIIC	12.70	57	83.60%	12.53	68	82.34%
IVA	14.78	154	85.37%	14.89	251	85.15%
IVC	18.62	21	90.01%	20.05	22	90.54%
VA	20.83	29	90.35%	22.38	29	90.43%

T F = total face Aur. Ht. = auricular height No. = number

of the face, when compared with auricular height, increases 15 per cent from 5.5 to 20 years of age in the male and 17.5 per cent in the female (again the relatively longer faced female). The relative width of the face compared with the width of the brain case (Table VIII) is 83.2 per cent at 5.5 years of age in the male and rises to approximately 91 per cent at 20 years. In the female it is 82.7 per cent at 5.5 years, reaching approximately 89 per cent earlier on the developmental scale (Stage IVC), but at the same chronologic age as the

XUM

male. The female face is thus relatively narrowed in this respect. The relative depth of face, as compared with greatest head length (Table IX), is much lower. The face is 41.67 per cent of head length at 5.5 years and rises to 49.5 per cent at 20 years of age in males. In females it is not much different. At 5.5 years it is 42 per cent and rises to 49.65 per cent at 22 years of age. The similarity of the two sexes in the relative face depth in this instance is due to the shorter head length in the females.

TABLE VIII

RELATIVE AVERAGE DIMENSIONS OF BIZYGOMATIC AS COMPARED WITH HEAD WIDTH

	MALES			FEMALES		
STAGES	AGES	NO.	BI x100 / HEAD W	AGES	NO.	BI x100 / HEAD W
IIA	5.53	17	83.20%	5.53	19	82.73%
IIC	7.69	13	84.30%	6.67	15	83.43%
IIIA	9.00	114	84.04%	8.40	107	85.35%
IIIB	10.91	122	85.24%	10.52	158	86.49%
IIIC	12.70	56	86.22%	12.53	68	87.03%
IVA	14.78	154	87.33%	14.89	252	88.01%
IVC	18.62	21	89.00%	20.05	22	88.85%
VA	20.83	29	91.10%	22.38	29	85.63%

Bi = bizygomatic W = width

TABLE IX

RELATIVE AVERAGE DIMENSIONS OF FACE DEPTH (GONIOMENTON) AND HEAD LENGTH

	MALES			FEMALES		
STAGES	AGES	NO.	G Mx100 / HEAD L.	AGES	NO.	G Mx100 / HEAD L.
IIA	5.53	13	41.67%	5.53	11	42.19%
IIC	7.69	12	43.06%	6.67	9	43.72%
IIIA	9.00	69	44.22%	8.40	72	45.11%
IIIB	10.91	85	45.03%	10.52	106	45.42%
IIIC	12.70	53	47.02%	12.53	47	45.53%
IVA	14.78	104	47.62%	14.89	145	46.86%
IVC	18.62	19	49.72%	20.05	19	50.82%
VA	20.83	27	49.58%	22.38	21	49.65%

G M = goniomenton L. = length No. = number

Further modification of the face due to growth changes may be noted by comparing two dimensions which are on the same plane but at different levels. For example, in the vertical plane the dimension of ramus height may be compared with that of total face height. The former is in the back of the face, the latter in the front. Such comparison (Table X) shows first an initial rise of 2.5 per cent in the male and none in the female; then there is a decrease in the relative height of the ramus, due to an increase in total face height at this time, of both males and females which is followed by an increase. In the male this increase exceeds the relative height of the ramus at the beginning by 7.5 per cent; in the female it just comes up again to the initial proportion. The face of the male is thus lengthened in the back relatively more than the face of the female.

TABLE X

RELATIVE AVERAGE DIMENSIONS OF RAMUS AND TOTAL FACE HEIGHTS

	MALES			FEMALES		
STAGES	AGES	NO.	Ra Hx100 / TOTAL F	AGES	NO.	Ra Hx100 / TOTAL F
IIA	5.53	11	46.05%	5.53	6	45.31%
IIC	7.69	9	48.49%	6.67	8	45.16%
IIIA	9.00	69	46.01%	8.40	43	44.67%
IIIB	10.91	62	45.89%	10.52	49	42.88%
IIIC	12.70	40	45.34%	12.53	27	43.92%
IVA	14.78	121	47.14%	14.89	84	44.59%
IVC	18.62	15	49.93%	20.05	18	46.63%
VA	20.83	25	53.59%	22.38	18	45.54%

No. = number Ra H = ramus height F = face

Growth changes in transverse dimensions at different levels may also be noted when comparisons are made between the bizygomatic and bigonial widths. Thus, (Table XI) the relative bigonial dimension rises less than 1 per cent in the female and more than 3 per cent in the male. This indicates a tendency of the male to develop a relatively broader jaw than the female.

TABLE XI

RELATIVE AVERAGE DIMENSIONS OF BIGONIAL AND BIZYGOMATIC WIDTHS

	MALES			FEMALES		
STAGES	AGES	NO.	Big. x100 / BIZYGO.	AGES	NO.	Big. x100 / BIZYGO.
IIA	5.53	17	70.20%	5.53	19	72.44%
IIC	7.69	13	71.23%	6.67	15	72.03%
IIIA	9.00	114	73.37%	8.40	107	72.71%
IIIB	10.91	122	73.48%	10.52	158	72.92%
IIIC	12.70	56	73.95%	12.53	68	72.27%
IVA	14.78	154	74.47%	14.89	252	73.47%
IVC	18.62	21	74.46%	20.05	22	73.42%
VA	20.83	29	73.41%	22.38	29	73.13%

Big. = bigonial Bizygo. = bizygomatic No. = number

In similar comparisons of anteroposterior dimensions (Table XII) it is quite clear that the relative depth of the face at the lower level increases more (from gonion to menton) than that at the higher level (from external auditory meatus to nasion). This increase, however, is also more accentuated in the male than in the female. In the former it rises 7 per cent, in the latter only 4.5 per cent. This gives the males also a relatively deeper face in the region of the mandible, meaning, of course, a more prominent chin.

Of particular interest are those growth changes which modify the relative dimension of the upper and the lower face to total face height. Thus the upper face, when compared with the total face height (Table XIII), decreased its relative dimension approximately 1.5 per cent in the male and 3 per cent in the female. Similarly, the relative changes in the lower face height (Table XIV) decreases also 1.5 per cent in the male and 1 per cent in the female. This is somewhat surprising, because, since the face as a whole increases in

height absolutely, its constituent parts should increase proportionally. It should, however, be remembered that while the face increases its total dimension, the dentition is developing between the two jaw bones. The relative dental height increasing 3.3 per cent in the males and 2.7 per cent in the female is then sufficient to offset the decreases shown in the upper and lower relative face heights (Table XV). The average relative dimensions of the upper and

TABLE XII

RELATIVE AVERAGE DIMENSIONS OF GONIOMENTON TO AURICULONASION DEPTHS

	MALES			FEMALES		
STAGES	AGES	NO.	G Mx100 / Au Na	AGES	NO.	G Mx100 / Au Na
IIA	5.53	13	89.33%	5.53	11	87.63%
IIC	7.69	12	89.09%	6.67	9	91.93%
IIIA	9.00	69	91.26%	8.40	72	92.95%
IIIB	10.91	85	92.24%	10.52	106	93.14%
IIIC	12.70	53	94.72%	12.53	47	91.95%
IVA	14.78	104	94.06%	14.89	145	93.34%
IVC	18.62	19	98.20%	20.05	19	91.05%
VA	20.83	27	97.40%	22.38	21	92.00%

G M = goniomenton Au Na = auriculonasion No. = number

TABLE XIII

RELATIVE AVERAGE DIMENSIONS OF UPPER FACE AND TOTAL FACE HEIGHTS

	MALES			FEMALES		
STAGES	AGES	NO.	U Fx100 / Total F	AGES	NO.	U Fx100 / Total F
IIA	5.53	17	61.25%	5.53	19	62.19%
IIB	7.69	13	61.50%	6.67	15	60.63%
IIIA	9.00	114	60.29%	8.40	107	60.65%
IIIB	10.91	121	60.85%	10.52	159	60.61%
IIIC	12.70	96	60.61%	12.53	68	61.08%
IVA	14.78	154	60.46%	14.89	251	59.75%
IVC	18.62	21	59.09%	20.05	22	59.14%
VA	20.83	29	59.94%	22.38	29	58.96%

U F = upper face F = face

TABLE XIV

RELATIVE AVERAGE DIMENSIONS OF LOWER FACE AND TOTAL FACE HEIGHTS

	MALES			FEMALES		
STAGES	AGES	NO.	L Fx100 / Total F	AGES	NO.	L Fx100 / Total F
IIA	5.53	17	33.65%	5.53	19	33.11%
IIB	7.69	13	32.30%	6.67	15	32.32%
IIIA	9.00	114	32.84%	8.40	107	32.04%
IIIB	10.91	121	32.38%	10.52	159	32.18%
IIIC	12.70	57	31.90%	12.53	68	32.44%
IVA	14.78	154	32.21%	14.89	251	32.15%
IVC	18.62	21	31.79%	20.05	22	31.21%
VA	20.83	29	32.16%	22.38	29	31.85%

L F = lower face F = face

lower face heights are also of interest in this connection. As seen in Table XVI, the proportion of the lower to the upper face height remains approximately the same throughout the entire course of development.

TABLE XV

RELATIVE AVERAGE DIMENSIONS OF DENTAL AND TOTAL FACE HEIGHTS

	MALES			FEMALES		
STAGES	AGES	NO.	D Hx100 / Total F	AGES	NO.	D Hx100 / Total F
IIA	5.53	17	4.59%	5.53	19	5.92%
IIC	7.69	13	5.56%	6.67	15	6.55%
IIIA	9.00	114	7.04%	8.40	107	7.02%
IIIB	10.91	121	7.20%	10.52	159	7.15%
IIIC	12.70	57	7.52%	12.53	96	7.30%
IVA	14.78	154	7.37%	14.89	251	8.06%
IVC	18.62	21	7.90%	20.05	22	8.63%
VA	20.83	29	7.30%	22.38	29	8.65%

D H = dental height F = face

TABLE XVI

RELATIVE LOWER FACE HEIGHT AS COMPARED WITH UPPER FACE HEIGHT

	MALES			FEMALES		
STAGES	AGES	NO.	L. F. Hx100 / U. F. H.	AGES	NO.	L. F. Hx100 / U. F. H.
IIA	5.53	17	54.09%	5.53	19	53.24%
IIC	7.69	13	52.52%	6.67	15	53.31%
IIIA	9.00	113	54.47%	8.40	107	52.86%
IIIB	10.91	121	53.05%	10.52	158	53.10%
IIIC	12.70	57	52.63%	12.53	69	53.12%
IVA	14.78	154	53.41%	14.89	251	53.81%
IVC	18.62	21	53.80%	20.05	22	52.76%
VA	20.83	29	54.10%	22.38	29	54.05%

No. = number L. F. H. = lower face height U. F. H. = upper face height

Another interesting item in this series of relationships is the one concerned with the relative dimensions of nasal to upper face height. Actual figures indicate (Table XVII) that nasal height increases 9 per cent in the males and 7 per cent in the females, showing, of course, that as the bones forming the upper face grow longer, they become more hollowed out by the nasal aperture; also that the greater increase in relative nasal height in males gives them an advantage in the length of the nose.

Comparisons can also be made in the sagittal plane between dimensions from the ear-hole (external auditory meatus) to prosthion and from the ear-hole to infradentale. Such dimensions, if compared with the upper face depth (auriculonasion), denote the relative position of the dental arches to the upper part of the face, since prosthion and infradentale are actually the most anterior points in the curve of the alveolar and dental arches. The higher the relative dimensions of auriculo-prosthion and auriculo-infradentale, the more anterior the alveolar and dental arches project when related to the ear-nasion dimensions. From the

figures obtained (Tables XVIII and XIX) it is quite evident that the females, although having less projecting jaws in infancy than the males, become gradually more prognathous than do the males. Tables XX, XXI, XXII, and XXIII are appended for general reference. The averages in these tables were used in the calculations presented in the tables preceding.

TABLE XVII

RELATIVE AVERAGE DIMENSIONS OF NOSE AND UPPER FACE HEIGHTS

	MALES			FEMALES		
STAGES	AGES	NO.	$\frac{\text{NaHx100}}{\text{U Face}}$	AGES	NO.	$\frac{\text{NaHx100}}{\text{U Face}}$
IIA	5.53	16	68.36%	5.53	13	71.31%
IIC	7.69	12	73.26%	6.67	12	73.03%
IIIA	9.00	97	72.15%	8.40	97	73.44%
IIIB	10.91	109	73.12%	10.52	144	73.85%
IIIC	12.70	53	74.53%	12.53	87	75.80%
IVA	14.78	138	76.10%	14.89	217	75.75%
IVC	18.62	20	77.55%	20.05	21	77.33%
VA	20.83	28	77.54%	22.38	25	78.12%

NaH = Nasal height U = Upper

TABLE XVIII

RELATIVE AVERAGE DIMENSIONS OF AURICULOPROSTHION AS COMPARED WITH AURICULONASION DEPTH

	MALES			FEMALES		
STAGES	AGES	NO.	$\frac{\text{A. Pr. x100}}{\text{Aur. Nas.}}$	AGES	NO.	$\frac{\text{A. Pr. x100}}{\text{Aur. Nas.}}$
IIA	5.53	17	96.04%	5.53	19	93.92%
IIC	7.69	13	93.53%	6.67	15	94.73%
IIIA	9.00	114	97.65%	8.40	107	97.42%
IIIB	10.91	122	97.87%	10.52	158	97.69%
IIIC	12.70	56	98.28%	12.53	68	97.70%
IVA	14.78	154	98.50%	14.89	252	98.89%
IVC	18.62	21	100.93%	20.05	22	101.55%
VA	20.83	29	98.57%	22.38	29	100.00%

No. = number A. Pr. = auriculoprosthion Aur. Nas. = auriculonasion

TABLE XIX

RELATIVE AVERAGE DIMENSIONS OF AURICULOINFRADENTALE AS COMPARED WITH AURICULONASION DEPTH

	MALES			FEMALES		
STAGES	AGES	NO.	$\frac{\text{A. In. x100}}{\text{Aur. Nas.}}$	AGES	NO.	$\frac{\text{A. In. x100}}{\text{Aur. Nas.}}$
IIA	5.53	16	92.11%	5.53	14	91.82%
IIC	7.69	12	92.53%	6.67	11	93.07%
IIIA	9.00	98	95.80%	8.40	96	94.84%
IIIB	10.91	106	96.05%	10.52	136	96.14%
IIIC	12.70	51	97.78%	12.53	60	95.89%
IVA	14.78	135	97.65%	14.89	210	98.53%
IVC	18.62	21	101.87%	20.05	21	103.39%
VA	20.83	28	99.67%	22.38	26	101.91%

No. = number A. In. = auriculo-infradentale Aur. Nas. = auriculonasion

TABLE XX

MEASUREMENTS OF THE HEAD AT VARIOUS STAGES OF DEVELOPMENT

Boys

STAGES	AURICULAR HEIGHT			HEAD LENGTH			HEAD WIDTH			MINIMUM FRONTAL		
	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.
IIA	17	128.18	6.39	17	178.35	8.67	17	140.77	4.67	19	98.37	4.62
IIC	13	129.77	5.19	13	180.39	5.94	13	142.08	4.70	14	100.93	5.52
IIIA	114	132.76	5.31	113	183.75	6.72	112	144.35	5.31	114	102.50	4.62
IIIB	122	132.33	5.43	122	184.68	5.64	122	144.81	4.62	122	104.90	4.20
IIIC	57	131.32	4.80	57	185.42	6.15	57	146.68	5.07	57	103.97	4.21
IVA	154	133.93	5.25	154	188.85	6.60	154	149.27	5.52	154	106.45	4.53
IVC	21	133.95	4.29	21	192.43	6.33	21	154.15	6.15	33	108.73	5.76
VA	29	135.41	4.37	29	197.24	4.11	29	153.44	5.67	29	107.17	4.00

Girls

IIA	19	125.21	6.06	19	171.90	6.69	19	136.90	5.58	19	97.26	4.59
IIC	14	128.00	4.47	15	176.60	6.39	15	140.00	4.75	15	97.40	3.28
IIIA	106	127.48	5.02	107	175.99	5.67	107	139.76	4.65	107	100.13	4.11
IIIB	159	128.13	4.74	158	179.40	6.09	159	142.51	4.95	158	101.77	4.38
IIIC	69	128.83	4.83	69	182.83	6.24	69	144.13	5.22	68	103.18	4.19
IVA	252	130.25	5.31	251	184.05	5.64	251	145.51	5.07	253	104.68	4.41
IVC	21	128.70	4.70	23	183.30	5.58	23	148.57	4.12	23	106.00	2.95
VA	29	128.69	5.85	29	184.14	4.55	29	153.14	4.89	31	105.61	3.83

No. = number S. D. = standard deviation

TABLE XXI

MEASUREMENTS OF THE FACE AT VARIOUS STAGES OF DEVELOPMENT. DIMENSIONS OF HEIGHT

Boys

STAGES	TOTAL FACE HEIGHT			UPPER FACE HEIGHT			LOWER FACE HEIGHT			DENTAL HEIGHT			NASAL HEIGHT			RAMUS HEIGHT		
	NO.	AVER.	S. D.	NO.	AVER.	S. D.	NO.	AVER.	S. D.	NO.	AVER.	S. D.	NO.	AVER.	S. D.	NO.	AVER.	S. D.
IIA	17	96.13	6.24	17	58.88	3.97	17	32.35	2.89	17	4.41	2.64	16	40.25	3.87	11	44.27	5.91
IIC	13	96.92	4.38	13	59.61	4.18	13	31.31	1.97	13	5.39	2.59	12	43.67	4.48	9	47.00	3.65
IIIA	114	102.62	5.43	113	61.87	3.45	114	33.70	2.70	114	7.22	2.42	97	44.64	2.19	69	47.22	4.29
IIIB	121	107.00	5.10	121	65.11	3.60	121	34.54	2.62	122	7.70	1.99	109	47.61	3.27	62	49.10	4.92
IIIC	57	109.79	5.82	57	66.54	4.03	57	35.02	2.95	57	8.26	2.14	53	49.59	3.72	40	49.68	4.67
IVA	154	114.34	6.66	154	69.13	4.17	154	36.92	3.07	154	8.33	2.41	138	52.61	3.84	121	53.90	6.27
IVC	21	120.57	5.97	21	71.24	4.36	21	38.33	2.31	34	8.85	1.94	20	55.25	3.56	15	60.20	5.97
VA	29	122.34	6.37	29	72.72	4.59	29	39.34	2.96	29	8.93	2.69	28	56.39	3.94	25	65.56	4.19

Girls

IIA	19	91.58	3.53	19	56.95	3.24	19	30.32	1.17	19	5.42	2.23	13	40.61	2.47	6	41.50	4.83
IIC	15	94.67	4.01	15	57.40	3.28	15	30.60	1.99	15	6.20	3.25	12	41.92	3.52	8	42.75	3.03
IIIA	107	98.26	4.95	107	59.59	3.63	107	31.50	2.13	107	6.90	2.37	97	43.76	3.26	43	43.86	2.68
IIIB	159	103.04	5.76	158	62.45	4.08	158	33.16	2.53	158	7.37	2.20	144	46.12	3.18	49	44.18	3.94
IIIC	68	106.09	6.12	68	64.80	4.02	69	34.42	2.86	69	7.74	2.35	60	49.12	3.40	27	46.59	4.26
IVA	251	110.91	5.91	251	66.27	4.23	251	35.66	2.58	251	8.94	2.20	217	50.20	3.56	84	49.42	3.87
IVC	22	116.52	6.24	22	68.91	4.25	22	36.36	2.72	22	10.05	2.03	21	53.29	3.82	18	54.33	4.19
VA	29	116.38	5.25	29	68.59	3.45	29	37.07	2.80	28	10.07	2.84	25	53.68	2.81	18	53.00	4.74

TABLE XXII

MEASUREMENTS OF THE FACE AT VARIOUS STAGES OF DEVELOPMENT. DIMENSIONS OF WIDTH

Boys

STAGES	BIZYGOMATIC			BICONDYLAR			BIGONIAL			NASAL		
	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.
IIA	17	117.12	5.97	17	112.00	4.60	17	83.06	4.86	16	27.69	2.02
IIC	13	119.77	5.58	13	112.77	4.22	13	85.31	3.95	12	28.25	2.20
IIIA	114	121.31	5.07	114	115.60	5.79	112	88.10	4.17	97	29.56	1.87
IIIB	122	123.44	4.83	122	118.67	5.58	122	90.70	4.65	109	30.09	1.87
IIIC	56	126.47	5.08	57	121.21	5.61	57	93.53	4.86	53	30.83	1.82
IVA	154	130.36	6.06	154	124.71	6.36	154	97.08	6.09	137	32.72	2.36
IVC	21	137.19	4.65	21	130.00	4.25	21	102.15	6.90	20	34.80	2.50
VA	29	139.79	6.09	29	135.41	5.73	29	102.63	4.74	28	35.25	2.37

Girls

IIA	19	113.26	4.98	19	107.74	3.31	19	82.05	3.49	13	27.62	1.07
IIC	15	116.80	4.12	15	110.80	5.76	15	84.13	3.57	12	28.00	1.63
IIIA	107	119.29	4.89	107	113.70	4.89	107	86.74	4.15	97	28.51	1.85
IIIB	158	123.25	5.52	158	117.37	5.25	159	89.87	5.67	144	29.44	2.27
IIIC	68	125.44	4.56	68	118.54	5.52	67	90.66	3.63	60	30.82	2.29
IVA	252	128.06	4.65	252	121.99	4.92	252	94.09	5.46	217	31.55	2.11
IVC	22	132.00	4.30	22	127.68	3.65	22	96.91	3.19	21	32.76	1.90
VA	29	131.14	4.75	29	125.55	8.31	29	95.90	5.19	25	32.36	1.96

XUM

TABLE XXIII

MEASUREMENTS OF THE FACE AT VARIOUS STAGES OF DEVELOPMENT. DIMENSIONS OF DEPTH

Boys

STAGES	AURICULONASION			AURICULOPROSTHION			AURI.-INFRA.			AURICULOMENTON			GONIOMENTON		
	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.	NO.	AVERAGE	S. D.
IIA	17	83.18	4.67	17	79.88	4.24	16	76.62	5.07	17	89.82	6.45	13	74.31	4.97
IIC	13	87.18	2.97	13	81.54	3.97	12	80.67	4.15	13	90.69	6.24	12	77.67	4.03
IIIA	114	89.03	4.56	114	86.94	5.40	98	85.30	5.15	114	97.58	6.69	69	81.25	5.31
IIIB	122	90.16	4.21	122	88.24	4.92	106	86.60	4.71	122	99.63	6.99	85	83.16	5.40
IIIC	57	92.05	3.97	57	90.47	6.09	51	90.00	5.43	57	103.47	6.18	53	87.19	5.46
IVA	154	95.60	4.53	154	94.17	4.98	135	93.35	5.88	154	107.74	7.08	104	89.92	5.82
IVC	21	97.42	5.01	21	98.33	4.14	21	99.24	4.49	21	116.71	6.09	19	95.67	5.04
VA	29	100.41	4.63	29	98.97	5.37	28	100.08	6.72	29	119.21	6.99	27	97.79	7.26

Girls

IIA	19	83.00	3.16	19	77.95	5.05	14	76.21	2.81	19	86.68	5.05	11	72.73	4.54
IIC	14	84.00	3.68	14	79.57	3.37	11	78.18	4.04	14	91.00	4.29	9	77.22	1.99
IIIA	107	85.40	3.84	107	83.20	4.44	96	81.00	4.86	106	92.58	6.03	72	79.38	5.25
IIIB	158	87.49	3.93	158	85.47	4.83	136	84.11	4.92	158	96.79	6.78	106	81.49	5.31
IIIC	69	90.52	3.99	69	88.44	4.68	60	86.80	4.86	69	100.91	6.33	47	83.24	4.92
IVA	251	92.40	3.72	251	91.37	4.47	210	91.04	4.86	251	105.54	5.91	145	86.25	5.34
IVC	22	91.05	3.98	22	92.46	4.22	21	94.14	5.52	22	110.27	6.75	19	93.16	5.55
VA	29	92.00	4.47	29	92.00	4.38	26	93.77	5.07	29	110.07	6.42	21	91.43	1.70

Auri.-Infra. = auriculo-infradentale

A few charts may at this time be helpful in illustrating graphically several points of interest. The relative contribution of each part to the sum total of growth of the face may be illustrated by charting the cumulative increments on a percentage scale.

Chart 1 shows comparisons of growth increments of the face in height, width and depth, expressed in percentages. It is quite clear that growth takes place in all dimensions. But, as seen in the male chart, depth (goniomenton) proceeds at a higher percentage level than face height, face width being at the lowest level. In the females, height and depth cross each other's path at

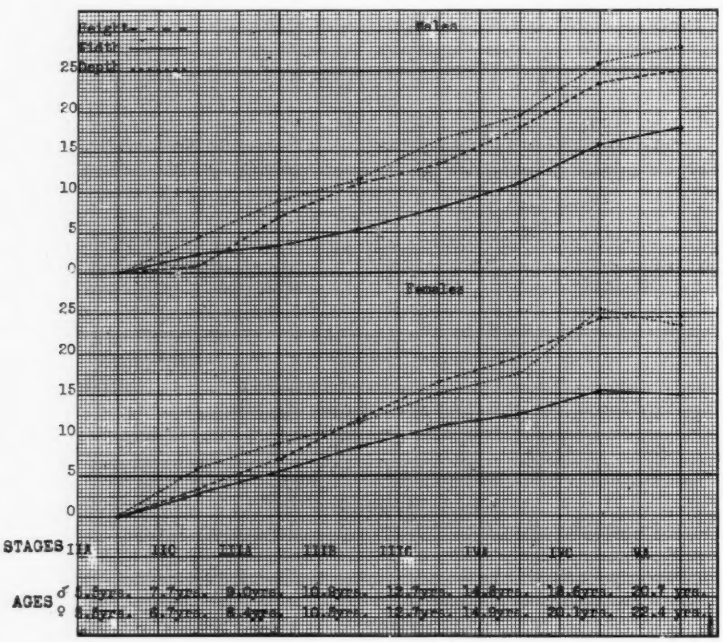


Chart 1.—Showing percentage additions of growth increments in height, width, and depth of males and females.

eleven and eighteen years of age. Of particular interest are the alternating characters of acceleration and retardation in the progress of height and depth increments. When the one increases, the other decreases in intensity. The female chart shows it even more clearly.

Chart 2 shows comparisons between males and females of the percentage increments in height, width and depth. It demonstrates quite clearly that in height the female face grows at a higher rate until about fifteen years of age when it slows up, remaining at the same level after twenty when the third molars begin to erupt. The male face continues to grow in height after the eruption of the third molars. It is the same with growth in width. In depth the female starts out with a spurt but slows down at nine years, while the male face continues its increase in depth until the end. A curious appearance in this chart is the relative decrease in the transverse and anteroposterior dimensions at the end stages. This has also been noticed in actual measurement. It seems that, as the females grow up, there is a great loss in subcutaneous tissue. The bony incre-

ments seem to be insufficient to make up for this discrepancy. As a result, girls beyond the sixteenth or seventeenth years show either no increase or an actual diminution in these dimensions. In boys the bony increments seem to make up for the disappearance of subcutaneous fat.

Chart 3 shows comparison of growth increments in the vertical plane at different levels. Thus, percentage increments of ramus height are compared with like increments of total face height. The male chart again shows the alternate character of growth in the front and back parts of the face and demonstrates that the ramus grows in spurts and relatively more than the total face. In the female

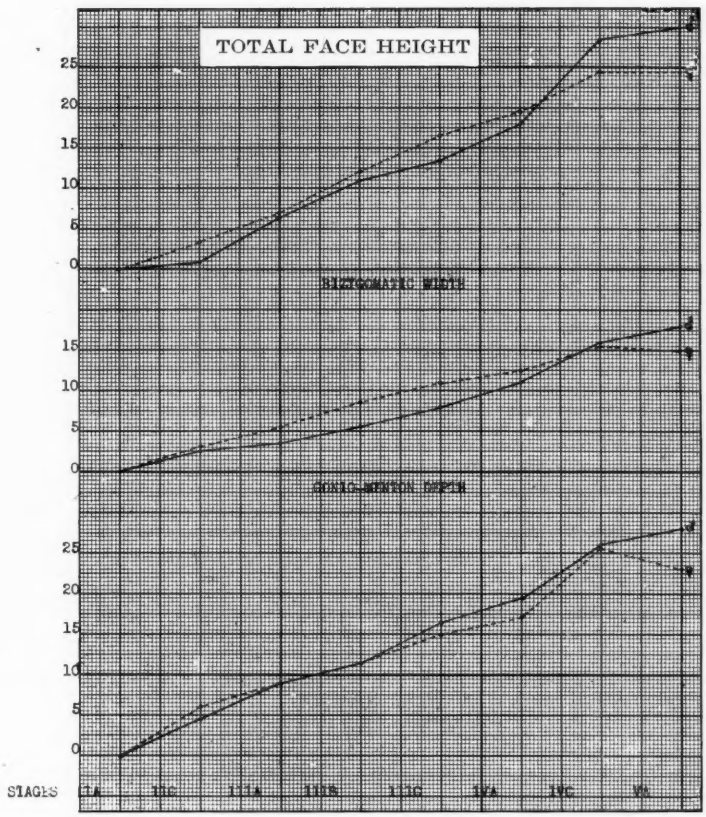


Chart 2.—Showing sex differences in percentage additions of growth increments in total face height, bizygomatic width, and goniomenton depth.

chart the ramus growth line rises and falls, showing its spurts of growth, reaching in the end a higher percentage level than the total face increments.

Chart 4, transverse increments, shows that the bigonial width increases at a higher percentage level than the bizygomatic width. This is more emphasized in the males than in the females. The increments in this plane are constant and diverging in the males, but alternate in the first half of the chart in the females. This chart shows that the lower part of the face widens more than the upper, but that it widens more in males than in females.

Chart 5, showing anteroposterior increments, demonstrates that the lower part of the face grows at a higher percentage level than does the upper. It also

shows that the percentage increments in both regions are higher in the male than in the female. The wider spread at the last two stages in the female seems to in-

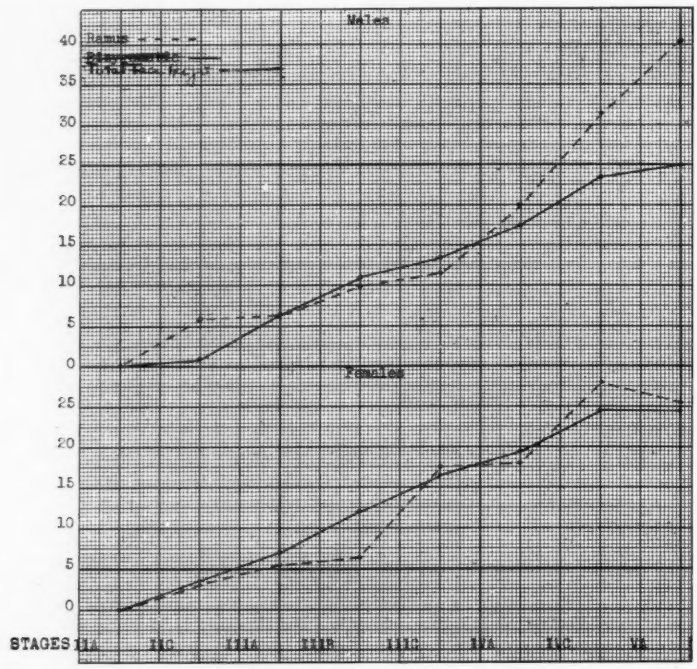


Chart 3.—Showing comparisons in percentage additions of growth increments in ramus height and total face height between males and females.

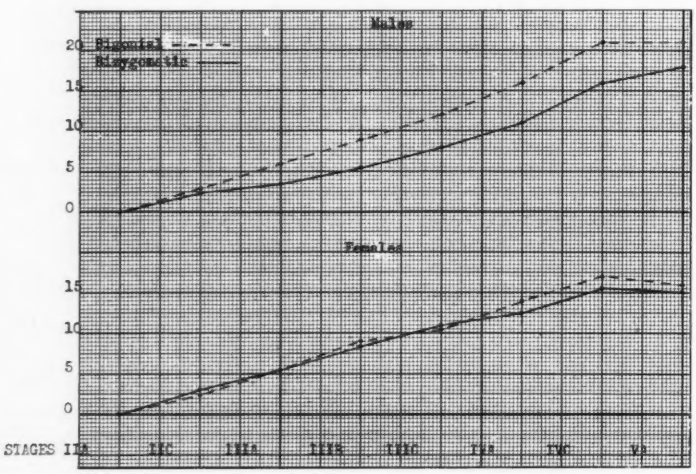


Chart 4.—Showing comparisons in percentage additions of growth increments at bigonial and bizygomatic levels between males and females.

dicate that the auriculonasion diameter increases considerably less than that of the male and ceases its increase at a much earlier period in development.

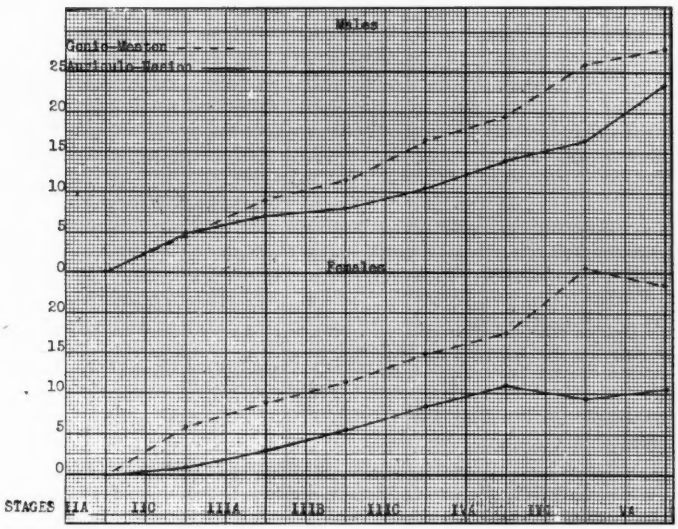


Chart 5.—Showing comparisons in percentage additions of growth increments in auriculonasion and goniomenton depths.

SUMMARY

The points to be made in this introductory report are:

1. That in the study of growth of the face, the meaning of increases in dimensions must be clearly understood.

2. That increase of the dimension of one part may mean decrease in substance (nasal aperture), and decrease in dimension of another part may mean addition of substance (relative decrease in upper and lower face height as compared with total face height—made up by development of dentition).

3. That the human face, as it is represented by this group, grows by increase in size in three planes: vertical, transverse, and anteroposterior.

4. That the dimensions are measurable by some sort of a measuring rod, while growth of the dimensions is measured by anatomic manifestations.

5. That the dimension of the human face, as represented by the group studied, is greatest in width, less in height and least in depth.

6. That the greatest dimension increases least and the smallest most.

7. That with increase in size of the human face there is a change in proportion of the dimensions studied.

8. That the dimensions of the same plane, at different levels, grow at different rates.

9. That, as the face grows longer, it increases vertically more in the back than in the front; transversely and anteroposteriorly more below than above.

10. That some of these changes are more emphasized in the male than in the female.

11. That the face of the female is relatively longer and that of the male is relatively broader and deeper. That the female jaw bones and dental arches are relatively more prognathous than those of the male.

12. That when the face increases its dimensions in height and depth, there is simultaneous but alternate acceleration and retardation of growth in the two

planes, at the different levels of the same plane and in different sections of the same dimension.

13. That the growth stages of the face are seriated in this paper not primarily according to chronologic age, but according to the sequence of eruption and shedding of deciduous teeth and appearance of permanent teeth.

14. That the greater bulk of the observations were made on the same growing individuals over periods of from two to seven years.

It is planned on a subsequent occasion to report the progress of growth changes in individuals.

This opportunity is taken to express my indebtedness to Professor Franz Boas for his first inspiration and his lasting interest in this work, to Dr. T. W. Todd for his encouraging and stimulating advice and to Dr. W. K. Gregory for his lasting friendly counsel in this as well as in all things scientific.

REFERENCES

1. Schultz, Adolph H.: Fetal Growth of Man and Other Primates, Quarterly Rev. Biol. **1**: 465, 1926.
2. Scammon, Richard E., and Calkins, Leroy A.: The Development and Growth of the Dimensions of the Human Body in the Fetal Period, Minneapolis, 1929, University of Minnesota Press.
3. Hellman, Milo: Some Changes in the Human Face as Influenced by the Teeth, Natural History, **26**: 1, 1926.
4. Gregory, William K.: Our Face From Fish to Man, p. 4, New York, 1929, G. P. Putnam's Sons.

XUM

HEREDITARY AND ENVIRONMENTAL FACTORS IN FACIAL DEVELOPMENT*†

T. Wingate Todd, F.R.C.S. (Eng.), Cleveland, Ohio

INTRODUCTION

THE establishment of the Charles B. Bolton Study in development of the face and jaws under my able colleague, Dr. B. Holly Broadbent, at Western Reserve University is the consummation of my hope that there would some day be founded a center for the investigation of orthodontic problems with the full facilities of team work by a group of associated scientific workers in all the different fields upon which orthodontia must depend for its proper comprehensiveness. The day is past when a solitary investigator can adequately encompass the task of investigation along the several lines, namely clinical orthodontic study, normal human facial and dental growth with its interruptions from whatever cause, correlated human bodily developmental growth, the necessary constitutional chemistry and the comparative research on mammals which gives suggestive leads for further analysis of our human problems. To Dr. Broadbent, as director of the Bolton Study, passes the responsibility of carrying on the intensive investigation of facial and dental growth in children in the group research now being prosecuted in our Institution along the various lines indicated above. Such mantle as I have had I throw over his shoulders though even now that mantle has shrunk to but a scantling through the vigorous growth of the truly orthodontic shoulders upon which it has fallen. This address is therefore, in a measure, my farewell.

My part in the investigation for the future lies in a coordination of the results obtained in all these different fields of endeavor and the interpretation of them for the mutual profit of our team members. Hence, though in direct orthodontic investigation I bid you farewell, I return quite as eagerly in my new rôle and hope to give you some suggestions for orthodontic study through the collateral investigations which I have mentioned. This paper becomes therefore an introduction to the address which Dr. Broadbent is preparing for the Chicago meeting.

My theme is the disentanglement of hereditary from environmental features in facial growth. I do not actually expect to progress very far in this analysis. The theme was stimulated by some observations made by Professor Boas many years ago on the changes in facial form brought about in the children of immigrants to this country. It seemed to us all extraordinary, when Professor Boas published this work, that any influence of environment should be so great as to modify materially the facial form of children born to parents after they had merely exchanged life in central Europe for life in New York. Any observation to which Professor Boas sets his signature is received with the very

*From the Western Reserve University and Brush Foundation.
†Joint Session of the Southern Society of Orthodontists and Ohio State Dental Meeting, Cincinnati, Ohio, December 3, 1931.

greatest respect. The chances are overwhelmingly in favor of it being correct. The measurements were made with the most meticulous care. Of the facts there can be no doubt at all. As to the cause of the change which apparently involves the subversion of a hereditary pattern Professor Boas left future investigation to decide. It is my purpose to lay before you certain of our studies which, I think, point the way to a solution of this problem.

THE SHEEP SKULL AS A STUDY IN GROWTH

Some years ago I obtained, by the kindness of the late Professor Sutherland Simpson and of Dr. H. S. Liddell, the skeletons of sheep from the experimental farm of Cornell University. These sheep were in pairs, each pair being the twin offspring from a single wether. They had been carefully nurtured throughout life, but one of each pair had its thyroid gland removed at between one and three months of age, the other being kept as a control. There were nine pairs, every pair except one being of the same sex. Seven sheep were thyroidectomized at one month, one at two months, one at three months of age. The parathyroid glands were carefully preserved: they were not removed along with the thyroid. Each pair of twins was sacrificed at successive ages from nine months to five years.

The normal sheep together with certain lambs obtained from other sources give us a study of the progressive features of facial growth in this animal. The thyroidectomized specimens enable us to detect the defects in growth consequent upon thyroidectomy.

In order to depict accurately the phases of growth it has been necessary to devise an instrument which should enable us to record quantitatively the successive expressions of growth. This instrument is the Reserve Craniostat. The skull is fixed in position in a frame provided with graduated arms enabling the investigator to record the precise position of any skull point in relation to any other skull point. Thus projection drawings accurate to 0.5 mm. can be plotted upon millimeter paper by reading the registration of the points recorded.

In this manner my colleague in the work, Mr. Ralph E. Wharton, has made projection scale orthodiagraphic drawings of the sheep skulls in left lateral view (norma lateralis sinistra), full face view (norma frontalis), top view (norma verticalis), and hind view (norma occipitalis). By the superposition of these drawings differences in size may be accurately defined.

One would imagine that sheep differ so much in size, the one from the other, that a technique of this kind could do no more than emphasize individual differences. In practice we do not find this to be so. Well-nurtured sheep, as they mature, keep remarkably constant in their growth. Individual differences are so small as to be negligible. There is a dimensional difference which makes its appearance toward the end of the first year of life, the male growing appreciably the larger. Thereafter the sexes must be segregated for study, but, if this precaution is taken, comparisons can be made just as effectually as in younger animals.

The most important aspect of growth is not size or dimension. It is that aspect which we usually call development, that is to say modification of proportion with increasing maturity. Many people call this aspect differentiation.

XUM

Differentiation is, however, on analysis, expressed as local growth in dimension with consequent readjustment in relation of the several structural parts involved. When we say the infant's brain-case grows faster than the face but the adolescent's face grows faster than the brain-case, we have an example of this differentiation.

Our analysis of the growth in a normal sheep skull demonstrated four definite areas of dimensional increase with different velocities and dates of growth. The cranium grows rapidly in very early life so that, before three months after birth, it is adult in dimensions. In the face there are three areas of growth, one behind the orbit, one just in front of the orbit and one in the anterior part or muzzle.

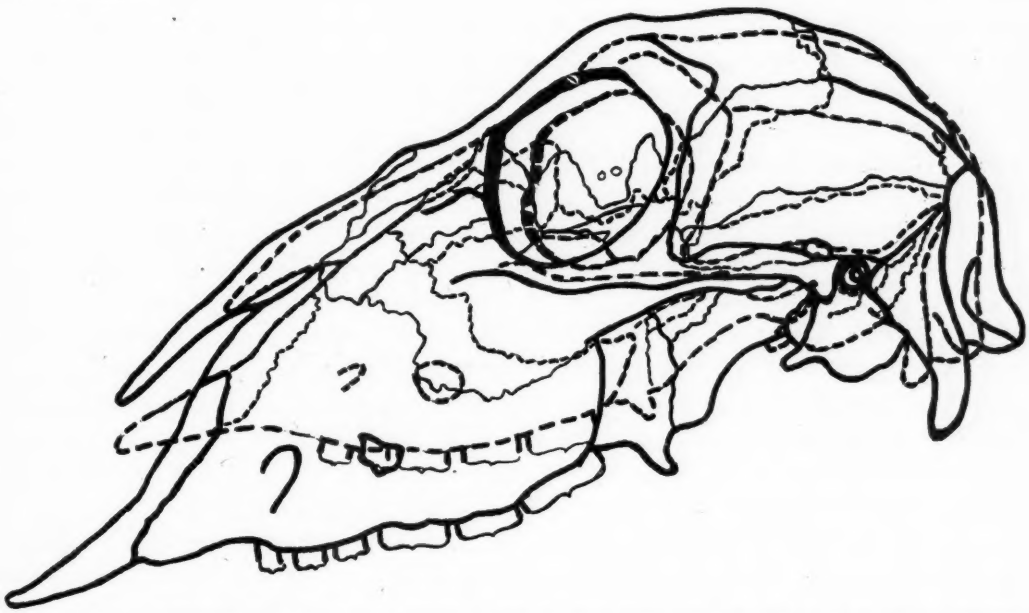


Fig. 1.—Superposition of twin sheep skulls twenty-four months of age. W. R. U. B1128, B1129. The smaller and defective skull (B1129) is that of a cretin, thyroidectomized at thirty-five days of age and showing a contracted snout and inhibited facial growth resulting from the experimental interference.

Growth occurs at the suture lines. The first of these areas of growth involves the sutures between frontal and parietal, face and sphenoid, palatal and pterygoid. The second comprises the sutures between nasal and frontal, maxilla and nasal, maxilla and lachrymal, maxilla and malar. The third is the suture between premaxilla and maxilla. The first we shall call the upper facial area, the second the lower facial and the third the muzzle area.

In the sheep antero-posterior growth occurs in the muzzle area up to four months, but vertical growth continues in the maxilla throughout the first two years. Antero-posterior growth takes place in the second or lower facial area throughout the first two years for the accommodation of the teeth, the last (third) molar erupting at about twenty-four months of age. This results in the malo-maxillary suture, or key-ridge area, being displaced from the interval between the last milk and first permanent molars to the area above the second permanent molar. Growth likewise occurs in the first or upper facial area during the entire period of lower facial growth in order to adjust the growing

face to the non-growing brain-case. There is also some growth or adjustment in upper facial area after facial form has stabilized itself. This brings about the typically bulbous contour of the sheep's face.

In a thyroidectomized sheep, assuming the operation performed when the animal is about one month old, the brain-case growth, being already practically fully completed, is not interfered with, but there are defects expressed in delayed tooth eruption and in interference with facial growth. The teeth, though delayed in eruption, are not deformed and the order of eruption remains unchanged. The upper jaw exhibits defective growth in maxillary tuber and still more in the anterior region, or "canine" area of maxilla, resulting in up-curving of the hard palate. A defect in growth of frontal and nasal bones and in front process of maxilla appears to leave the respiratory region incompletely unfolded. Important also is the defective growth in lower frontal-lachrymal-malar area whereby the upper jaw is never thrust forward as in normal growth.

The net result is a cramped ill-developed snout, a "juvenile" steep forehead and an up-curving of the hard palate (see Fig. 1).

There is no defect in growth of brain-case proper or of orbit and very little in the hafting zone (deeper orbit and palato-pterygoid), though the occipital formation undergoes some superficial defect secondary to the facial deformity. Apparently also there is no defect in mandibular growth so that, if the animal lives to the age of two years, the normally grown mandibular incisors project obviously beyond the upper lip and snout.

In this defective growth pattern no rigid time-schedule is followed. Growth being progressive and not static the character and degree of interference are not easily forecast. They follow the general principles just enunciated but their precise expression differs in different individual experiments.

There is one sheep sent to us by Professor Simpson which appears to me to have especial value. It is an animal upon which thyroidectomy was performed at forty-two days of age (B 732). For two months subsequent to the operation one-tenth of a milligram of thyroxin was administered daily. The animal lived till it was twenty-two months old and after death the brain was removed. The necessary mutilation of the cranium is of no significance to us, for no particular defect would be present in the brain-case. Tooth eruption has reached only the eleven months' stage, but the maxilla in which the teeth are lodged has not surpassed the development normal for seven months, and the snout has remained set at the three to four month stage.

The lesson from this skull is that thyroxin feeding, even though it be pushed to a degree adequate to restore the animal to something like physiological normality, does not repair a defect once caused. The date having passed for certain expressions of developmental growth without their appearance, these particular expressions are eliminated from the growth pattern. Adjustments are made, it is true, in the now defective skull but the missing details are lost for good.

These observations on normal and defective growth in the sheep skull have impressed me very much. They have considerable importance for students of orthodontia. The sheep skull has a face large enough and simple enough in its growth expressions to facilitate quantitative measurement and analysis.

XUM

This study teaches us that growth in dimensions is not uniform and continuous but local and discontinuous. There is a time-schedule which is followed in normal healthy animals. If the schedule is interrupted so that certain areas do not increase by the normal amount on time, they are likely to be permanently defective in their growth even though adjustments in skull pattern occur in an effort to compensate for the deficiency. What takes place in the sheep may also be inferred to take place in human skull growth. It will be our next task therefore to examine human growth with a view to ascertaining whether this inference be correct.

GENERAL PRINCIPLES OF HUMAN GROWTH

We usually think of growth as increase in dimensions and if the phrase is carefully safeguarded, so that it refers to localized dimensions as well as those of the entire body, then increase in dimensions is at least the most obvious expression of growth. But there is involved a deeper more fundamental principle than that of morphological extension. The qualitative changes in growth underlie the quantitative expression. The chemical constitution of the organism is changing with the progress of growth. It is this qualitative change which expresses itself in localized increases of magnitude which, modifying the proportions of the parts involved, call for mutual adjustment of areas under stimulation with areas in which there is no increasing magnitude at the moment. Growth therefore involves three concepts, namely, increase in dimensions, change in proportions and adjustment of parts. Perhaps it would be well to restrict the term growth to the first of these and reserve the term development for the other two. But this would be pedantic and the phrase developmental growth easily covers all. Indeed, in the progress of the organism to maturity there are phases during which actual increase in dimensions is at a minimum: change in proportions and adjustment are far the more important features. Such a phase is the post-adolescent development. Dr. Hellman has pointed out that the post-adolescent facial growth is largely expressed in the vertical dimension of the mandible and, though not entirely restricted to the male, is at least far more vigorous in that sex.

If we are contemplating growth in the body as a unit, there are four systems in which we may seek its expression. These are the skeleton, the muscles, the respiratory organs and the blood. All these are linked together so that we cannot study one without sidelong glances at the others, but the physical characters of the skeleton make it the most readily investigated of the four. And it is the one with which, as orthodontists, we are most deeply concerned.

Dimensional increase in the skeleton is the expression most closely studied in the past, but we have already realized the necessity of investigating the less obvious characters and it is not necessary to emphasize, to an orthodontic group, the significance of change in proportions and of adjustment between adjacent parts. Indeed it is these two aspects of growth which mostly exercise the orthodontist's attention and ingenuity.

The deeper we probe into the subject of growth the more confused we become in our attempt to segregate out the influences exerted by heredity and by environment. Supposing we take stature as a relatively simple problem

XUM

for consideration. In any group of boys or girls of approximately the same stage in development we shall find marked individual differences in height. We remind ourselves that in some families the majority of individuals are tall; in other families the majority are short. We are not surprised at a tall child in the first group or a short one in the second. We say these are expressions of the family line and that stature is largely a manifestation of hereditary pattern. But if we take two groups of boys, the one well-nurtured, the other living in conditions of intermittent starvation in a hook-worm district, and find, as we should, that the latter group are, on the average, shorter than the former, we should not hesitate to ascribe the difference to environmental interference. Thus, on general broad lines, we attempt a segregation of hereditary and environmental influences but, as yet, no great progress has been made in this analysis.

A few minutes ago I referred to the observations by Professor Boas on the facial dimensions of children born in New York and of their alien-born parents. Quite lately two pupils of Professor Boas, Drs. Bakwin and Bakwin, have published an investigation upon the dimensions of growing children in New York City.[1] These observers demonstrate the fact that the transverse dimensions of children suffering from gastro-intestinal complaints are less than those of children of equal age who are not so afflicted. The dimensions measured are facial as well as bodily. I think this paper of the Bakwins throws a most significant light upon Professor Boas' earlier observations. The narrow pinched face of children subject to chronic gastro-intestinal disorder you all know as well as I. That the relatively small dimensions are due to inhibition of growth is certain, but none of us knows what the ultimate effect on the physical pattern may be.

Our checks upon developmental growth hitherto have been limited to the measurement of dimensions and of chronological time. We have had no criteria by which to measure development itself. Consequently it has been necessary to assume, excepting instances of marked abnormality, that chronological time leaves its impress approximately uniformly on all children. That this is not really so we would all readily admit but we have been unable to measure differences and hence have been thrown back on averages as our standards for comparison. It may well be that the maximum possible growth in any arbitrary unit of time is not the optimum growth, but, failing a knowledge of what the optimum may be, we have had to substitute the average with its statistically derived error which is of course an arbitrary figure defining the range of a sample gathered in as random a manner as possible. From a biological point of view this is unsatisfactory. What we really want to know is the growth which would occur under optimum conditions. Then, and only then, can we measure accurately the deviation therefrom in any individual.

It is in the effort to secure such a biological assay that many investigators have taken roentgenograms of the hand and endeavored from these to assess the developmental progress of the skeleton and, by inference, of the body. By a refinement of this technique with which we, in Reserve, have been identified for some years, it is now possible to qualify the determinations of such relatively crude measures as height and weight. For details of the method I should have to refer you to the forth-coming publication on "Skeletal Growth and Develop-

XUM

ment'' by the recent White House Conference in the series of studies by Committee A of the Medical Service Section. The principles involved are however quite simple. Growth in length of the limb bones is a measure of progress toward adult size which of course varies within wide limits. But the appearance of ossification centers, the penetration of cartilaginous epiphyses by bone, and the final union of epiphyses with the bone shafts are measures of developmental progress. Like increase of dimensions these features are retarded or inhibited by disease, by malnourishment and by adverse socio-economic conditions. But whereas dimensions have admittedly a strong hereditary bias, these measurable features express development alone. They are not subject to hereditary influences. As you know a tall boy and a short boy may and usually do attain manhood at the same age. A baby boy at birth may weigh six pounds or ten pounds and still be within the normal dimensional range of babies correctly developed for their age. The baby's growth in height and weight after birth is carefully watched by the mother and the pediatrician because these are the main criteria by which development can be assessed. Nowadays we have the means of amplifying our assessment through the determination, upon suitable roentgenograms, of the real developmental progress registered in the bones. If the child shows adequate developmental progress, failure to maintain the average progress in dimensional increase may be discounted as of secondary and possibly of hereditary significance.

THE PRACTICAL SIGNIFICANCE OF FACIAL GROWTH

In the preceding sections of this paper I have pointed out that developmental growth consists of increase in dimensions locally expressed as a manifestation of developmental progress which is quantitatively measurable by increasing maturation of the skeleton. I have shown also how developmental growth can be retarded or inhibited experimentally, using the sheep skull as my illustration and I have made it clear that interruption in development implies local failure of dimensional increase with consequent modification of proportions and necessity for readjustment. With the enunciation of these principles my real function ceases. But it is the key-note of our team work in the laboratory of Anatomy and its allied Foundations at Reserve to hold our investigations and results in common. I am therefore drawing, in this section, with the consent of my colleagues in a common endeavor, upon the work of those with whom I am associated in order that I may point out to you the practical import of our investigations so far as orthodontia is concerned. I am but acting as the Prologue for Dr. Broadbent's presentation at the forthcoming Chicago Meeting.

Dr. Broadbent, as you know, has devised an instrument by which the progress of developmental growth in the face can be measured on the living child with an accuracy similar to that possible on the skull with the craniostat.

As a basis for that work on living children Dr. Broadbent, Dr. Hieber, Dr. Curran, Miss Tracy, Miss Perrine and Miss Forbes have made a detailed craniostatic study of the skulls of the dead babies and children housed in the Hamann Museum. The age and clinical history of all these children are known, thanks to the helpful cooperation of Dr. Gerstenberger and his staff at the Hospital for Babies and Children.

XUM

To Dr. Francis I am indebted for a careful study of the skeletal development of all these children in the light of their clinical history.

Dr. Hieber made tracings of the craniostatic scale-drawings in norma lateralis dextra (right lateral view) of all the children. But a dead child is a defective child and its developmental growth has been interrupted before its death unless indeed death came to a healthy child from intussusception, pneumonia, burns or accident. Consequently when Dr. Hieber superposed the tracings according to age he was unable to find that there was any real order in developmental progress of facial growth. Dr. Hieber demonstrated quite clearly that, in lateral view, the series of children's skulls show anteroposterior growth

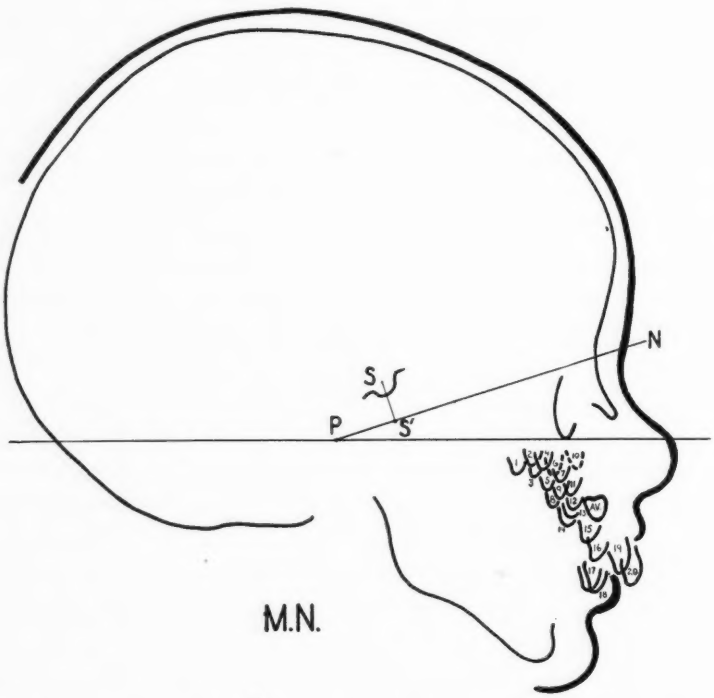


Fig. 2.—Simplified tracing of the superposition of twenty male Negro skulls ranging in age from birth to four years but in skeletal maturation from eight foetal months to five postnatal months. These extreme examples of skeletal retardation are the result of desperate illness and illustrate how fallacious conclusions may be drawn from an uncontrolled study of the skulls of dead children. The hatched incisor marked AV shows the relative position of the tooth in a normal boy three months of age in skull outline of the same boy. Orientation as stated in text.

of face obviously governed by increase in cranial capacity or, if you will, by brain growth. He also showed that there is a progressive developmental growth in the vertical direction of the face largely determined in all probability by respiratory needs. But there was no orderly progress in these children when measured by the lapse of time.

Coincidently with this work of Dr. Hieber, Mr. Mansfield was studying the development of cranial capacity upon the same children. He also found a disorderly increase in dimensions with the lapse of time. Then he conceived the idea of arranging the cranial capacities, not upon the basis of age but upon the stage of developmental progress as worked out by Dr. Francis upon the skeletons, and found that chaos was immediately reduced to order. What at first seemed to be individual differences disappeared. Cranial growth is not

XUM

a measure of lapse of time but of developmental progress. If, as he pointed out in one instance, the child, despite its age of fourteen months was but three months old in its developmental progress, its cranial size was still at about the three months' level.

Mansfield immediately communicated his results to Hieber who rearranged his tracings in order of development as determined by Francis. Then we got the exciting news that the facial growth also reduced itself to order. It was not so simple a problem as Mansfield had found in cranial growth. For, in the face, two factors are at work, namely brain development and respiratory needs. The body may grow in dimensions and need increased respiratory function but

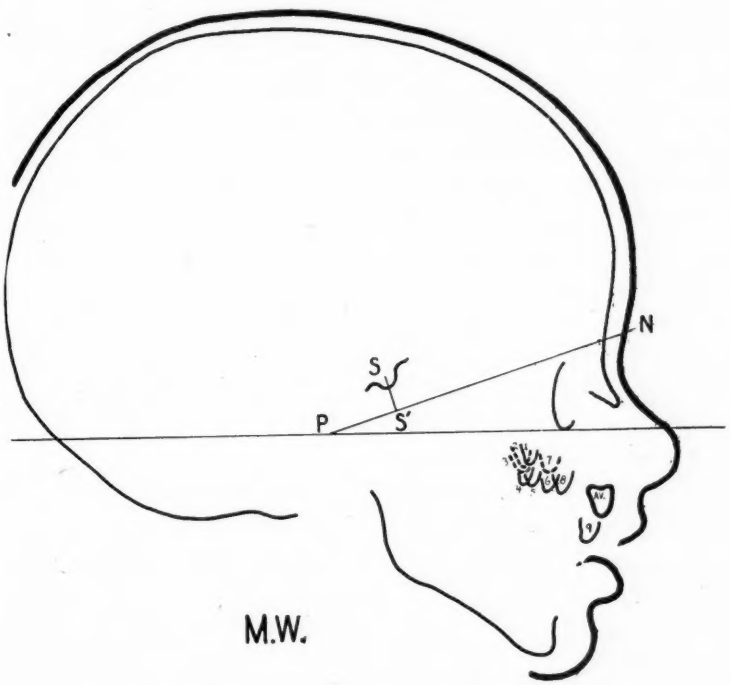


Fig. 3.—Simplified tracing of the superposition of nine male White skulls ranging in age from birth to fourteen months but in skeletal maturation from eight foetal months to three post-natal months. The incisor marked AV shows the relative position of the tooth in a normal boy three months of age in skull outline of same boy. Orientation as stated in text.

its development as measured by brain growth and skeletal progress may be held back. In such children the vertical growth of face will continue whereas antero-posterior growth will be less marked. The developing upper central milk incisor is a good indicator of progress in facial developmental growth. A line joining the porion or upper border of the ear-hole with nasion or fronto-nasal suture is provisionally used as the basis for superposition, and the intersection of this with a line drawn at right angles to it from the center of the sella turcica is the point to which all superposed tracings are adjusted.

Dr. Broadbent found that a child which is retarded in skeletal growth is usually also retarded in tooth development. He found that, in such children, no matter what the position of the incisor may be in the vertical plane, governed as it is by the respiratory needs of the growing body, the incisor and the maxillary growth trailed behind in antero-posterior projection. On the

other hand, if the child should show a greater developmental growth than is usual at any particular age in infancy the incisor was projected further forward in the antero-posterior direction.

For the immediate present our attention has been concentrated upon the manifestations of growth during the first year of life. We realise that, happily, the interruptions of growth brought about by infantile disease, intermittent starvation and adverse socio-economic conditions are not so severe as those experimental interruptions produced in the sheep. Recovery can and often does take place and during convalescence a spurt of developmental growth may make good the interruption. Nevertheless this fortunate result does not always occur, in which case maladjustment of facial growth necessarily follows and provides work for the orthodontist in later childhood.

In this essay I have but lightly sketched our first attempt at analysis of facial growth in childhood. The techniques employed and the details of assessment together with the prosecution of the research are the responsibility of Dr. Broadbent. I have but sought to whet your appetites for the important and truly fundamental work of Dr. Broadbent and his tireless enthusiastic team of assistants who are doing so much with the facilities so graciously placed at their disposal by the Bolton Fund to illuminate a very dark corner in our understanding of the problems of facial growth.

SUMMARY

1. Developmental growth expresses itself as local increase of dimensions in an orderly pattern which may be interrupted by disease, intermittent starvation and adverse socio-economic conditions.

2. Developmental growth implies modification of proportions and constant readjustment of parts as well as local dimensional increase.

3. The foregoing principles can readily be demonstrated by experimental interference.

4. Facial growth is subject to the same general influences and interferences as general bodily growth.

5. In early childhood antero-posterior (and transverse) growth is largely controlled by cranial (brain) development. Vertical facial growth is largely determined by bodily respiratory needs.

6. In suitably oriented roentgenograms the developing upper central milk incisor is a useful indicator of comparative facial growth.

7. The incisor travels forward with antero-posterior facial growth and downward with vertical facial growth.

8. Interruption in bodily development in infancy retards anterior progress of face (and incisor) more than vertical progress which is more closely related to bodily size than to bodily maturation.

9. As a rule the increased velocity of growth during convalescence or restoration repairs the defective facial growth but severe disturbance may remain as a permanent defect requiring readjustment of parts and in later childhood orthodontic treatment.

REFERENCE

1. Bakwin, Harry, and Bakwin, Ruth Morris: Body Build in Infants, J. Clin. Investigation **10**: 369, 1931.

XUM

AGE CHANGES IN THE TEMPOROMANDIBULAR JOINT AND THEIR IMPORTANCE IN ORTHODONTICS*

HUMPHREY HUMPHREYS, O.B.E., M.C., M.B., B.CH., M.D.S.,
BIRMINGHAM, ENGLAND

THE development of an individual recapitulates though imperfectly the evolutionary story of his species. Every growing animal climbs up his own family tree, and the latest chapters of the story are told, the higher branches of the tree are climbed, only at the end of the individual development. Thus if the child is father to the man, the fetus is a distant ancestor, and the embryo represents the remote mammalian forbears of the primates.

What I have to say is largely an application of this general biologic principle to the temporomandibular joint; though in this case, lessons may, I hope, emerge by no means remote from the practical consideration of orthodontia. During the first six years after birth the shape of the joint, so far as the temporal surface is concerned, is very much the same as in the anthropoid apes. The glenoid or mandibular fossa is shallow, and from its anterior edge a flat plane leads forward to the root of the zygoma. There is an absence of the articular tubercle or eminentia articularis which is such a marked feature of the adult joint. Corresponding to this simian joint outline is a curious limitation of movement. Attentive observation of the masticatory movements of children under six years will reveal the fact that little or no lateral movement is employed. All the complicated movements of the joint in man resolve themselves on analysis into two primary ones, and to permit these the joint is really a double one, being divided into two compartments, each lined with its own synovial sheath, by the interarticular fibrocartilage; in the upper compartment there takes place a horizontal gliding movement, and in the lower compartment a vertical hinge movement. A combination of movements in both compartments coupled with the fact that the temporomandibular articulations on either side may act simultaneously but in a dissimilar manner produces the variety of movements characteristic of the human jaw. Lateral movement or rotation of the jaw is produced by unilateral protraction or gliding forward, and is prevented in the apes by the interlocking canines. In the child there is no such anatomic obstacle to rotation of the jaw, and the fact that it is not employed is probably due to ancestral habit. Associated with this, perhaps in a causal relation, is the fact that the condyles are less oblique than in the adult and resemble the transverse condyles of the apes.

Let us now contrast with this the joint of the fully developed adult. The condyles are more oblique than in infancy; a change associated with the development of lateral movement, but the most important change in kind apart from general growth, is the great development of the articular eminence. What is the functional purpose of this new feature which distinguishes Homo sapiens

*A paper presented at the Second International Orthodontic Congress, London, July, 1931.

not only from the apes but even from inferior human species such as Neanderthal or Mousterian man? It insures that when the jaw is protruded, even if no hinge movement is employed and the incisors remain in contact, the condyles mount the articular eminence and the molar teeth become separated, so that in the movements of molar mastication the occlusal planes of maxillary and mandibular teeth remain more or less parallel. If the jointed mandible of the ape is represented mechanically by a pair of ordinary pliers, then the human jaw is nature's attempt to produce by a simple change in the joint the mechanism of the ingenious parallel bladed pliers we use in our laboratories. The latter is, as we know, a far more efficient crushing instrument in proportion to its strength than the former.

The changes in jaw movements produced by the development of the articular eminence have produced compensatory changes in the occlusal plane of the teeth to insure that in all positions of the normal mandible the teeth shall be in contact in several places at once. The occlusal plane has an anteroposterior curve with its convexity downward, known as the curve of Spee, which insures the required contact in simple protrusion. But rotation, which is simply unilateral protrusion, demands a similar curve in a lateral or transverse direction; this is obtained by the arrangement of the posterior molar teeth so that the occlusal surfaces of the maxillary teeth look downward and outward while the mandibular teeth look upward and inward.

Owing to the relatively flat glenoid surface in children, in Mousterian man, and in the apes, these occlusal curves are in them inappreciable.

So much for the differences between the joint of the infant and that of the adult. We now have to ask ourselves how the change occurs, whether it is spread evenly over the whole period of growth or whether it takes place more rapidly at some stage of that period than at others. I have, I believe, established the fact that in the great majority of individuals the growth of the articular eminence is hardly appreciable until the seventh year; it begins then but progresses very slightly until the tenth year, and then, when the child is nine, receives a marked and sudden impetus until by the twelfth year it is practically complete, and the joint has received its adult shape though not of course quite its adult size. The evidence is of three kinds.

(a) Examination of immature skulls from the vast collection at the Royal College of Surgeons shows that while there are, as we should expect, differences in the degree of development of the articular eminence between individuals of the same age, yet on the whole it is a fact of very general application that the main development of the eminence takes place in the tenth and eleventh years of life. The results of my examinations are shown in a chart illustrating the shape of the glenoid cavity at different age periods from birth to adult life (Fig. 1).

(b) Radiographic examination of the skulls of a number of living subjects gives the same result.

(c) A study of the occlusal movements in children yields evidence pointing to the same conclusion. With normal articulation the jaw cannot be protruded until the jaws are opened sufficiently to disengage the overlapping in-

XUM

cisors. But when the incisors bite edge to edge, and in postnormal occlusion with protruding maxillary incisors, it is possible to protrude the mandible without opening the jaws. It will be found that when this is done by children of twelve years and over, there is some separation of the molar teeth even though the front teeth are in close contact. This separation is of course produced by the condyles mounting the articular eminence and forcing the mandibular molars downward. But when the same movement is done by children of nine and under, the molar teeth do not lose contact at all but remain in occlusion. This proves that during those years the articular eminence is undeveloped. As it is also undeveloped in

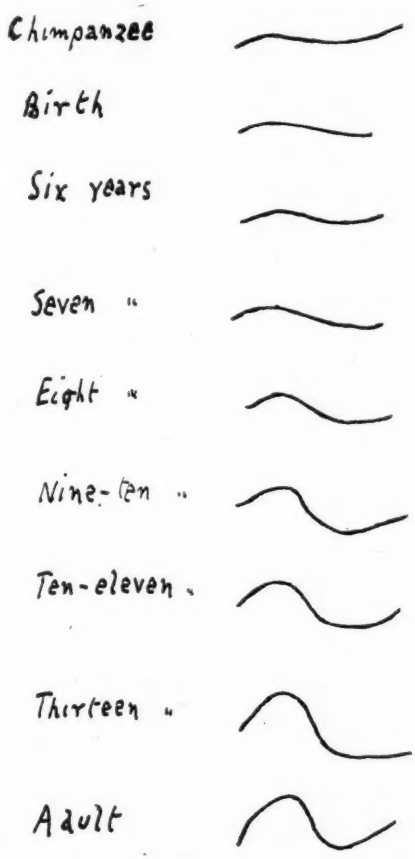


Fig. 1.

Mousterian man, it has probably been one of the latest landmarks in man's evolutionary history.

These facts have a very practical bearing on the orthodontic treatment of postnormal occlusion. It is obvious that if this condition is treated by a method which aims at moving the mandible as a whole forward in relation to the maxilla, the condyle at the conclusion of active treatment will not lie in its normal position, separated from the deepest part of the glenoid fossa only by the interarticular fibrocartilage, but will be forward of that point, and if the articular eminence is already developed, downward as well. I have endeavored to investigate the changes, if any, that take place in the joint after such treatment, clin-

ically and by radiographs: in this case examination of dried skulls is of no service, and the opportunity of postmortem research on treated cases of postnormal occlusion is so rare as to be negligible.

The clinical evidence of my own practice has taught me that when postnormal occlusion is treated by forward movement of the mandible as a whole in children of nine years and under, retention for six to nine months will produce a condition in which it is impossible for the child by any movement natural or induced to move the jaw back to its old position. When children of twelve and over, however, are treated for the same condition in the same way, the result is different. Although after sufficient retention the jaw may be held naturally and normally in its new forward position, and although the practical result aimed at in the treatment may thus have successfully been attained, it is usually, in my experience, possible to induce movements by which the jaw can be restored to its old position.

How should this clinical difference in the result of treatment between the child and the adolescent be interpreted? Clearly it is the result of differences in bone growth, and it will help us to understand these and be a guide to further research if the directions of bone growth which can explain the clinical results are analyzed and studied separately.

(a) It has been suggested by many observers that if the mandible is brought forward and kept there for a time, the head of the condyle will grow relatively faster upward and backward until in the end it occupies its old position relative to the glenoid fossa. The different results of treatment after twelve years would then be due to a diminished power of growth.

(b) My own suggestion is that the better results of early treatment in postnormal occlusion are due to the development of the articular eminence after the tenth year. It is a commonplace of physiology and pathology that while pressure has a considerable influence on the direction of growth of actively growing bone, pressure on bone already formed is far less effective. If, therefore, the condyle is moved to a forward position before the articular eminence is formed and is kept there by mechanical retention, its pressure on the undersurface of the temporal bone will insure that the articular eminence also will develop further forward than it would otherwise have done. In other words the temporal surface of the actively developing joint will be moulded around the condyle in its new position. If, however, this surface is already fully developed as in children over twelve, it is not plastic enough to suffer any great change when the condyle is moved forward, and the latter will continue to lie, even after retention, halfway up its sloping surface, and therefore will be capable of relapse to its old position.

(c) The eruption of the second molars at twelve years of age is accompanied by an upward growth of the alveolus in the molar region. If the mandible is moved forward and retained in its forward position at or before that age, the second molars will tend, or may be encouraged, to continue their eruption until the maxillary and mandibular teeth occlude. Retention will then be permanent even if no change at all takes place in the region of the condyle. Mr. Dolamore drew attention to this some years ago.[1] If the treatment takes place

XUM

after eruption of the second molars is completed, permanent retention from this cause is unlikely.

Thus the clinical results I have described can be interpreted equally well in any of these three ways. And it is indeed probable that all three types of growth are operative together. Have we any evidence other than clinical which points to one or the other being of greater importance? Breitner[2] at Vienna subjected Rhesus monkeys to powerful intermaxillary traction for eighty-two days and succeeded in moving the mandibular teeth forward by one unit. Examination of the temporomandibular joints showed that there had been absorp-

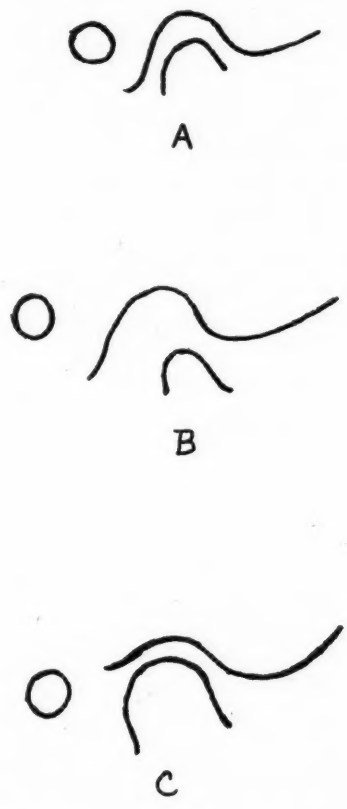


Fig. 2.

tion of bone from the anterior surface of the condyle and posterior slope of the articular eminence, and deposition of bone on the posterior surface of the condyle and posterior wall of the glenoid cavity. In other words, the glenoid cavity as a whole had been displaced forward while the condyle had grown backward. There were also signs of some remodelling of the angle of the mandible which had become more obtuse.

I am endeavoring to trace growth changes in the condyle region in treated cases of postnormal occlusion by a radiographic technic. By this means it is possible to register the growth of the same individual over a period of years; and though I have not been engaged on the work long enough to publish results that prove anything, the technic (described in the discussion) is not difficult,

XUM

and my whole purpose in bringing this communication to your notice is to encourage others to make similar observations. Fig. 2 shows tracings made from radiographs of lateral heads. *A* and *B* were taken of the same child on the same day; *A* with the mandible in its habitual (postnormal) position; *B* with the mandible moved forward until the teeth were in normal occlusion. No movement of individual teeth was necessary to enable the patient to do this, as the deformity was simple and due to thumb-sucking. *C* shows what I expect to see in this case twelve months hence, the jaws having been retained forward in normal occlusion for that period. Actually it is from a radiograph of another individual, clinically almost identical with the child shown in *A* and *B*, after the mandible had been moved forward and retained there for twelve months.

Practical deductions of some importance follow. Children of similar age will always vary in the degree of development of their jaws; but it is true, in general, to say that the correction of postnormal occlusion should be undertaken before the tenth year. The mandible can then be moved forward bodily with every confidence that a short period of retention will see it securely established in its new position. After the twelfth year, however, this is no longer the case, and in my own practice I no longer attempt after that age to move the mandible forward as a whole, but prefer to correct the condition by movement of the teeth alone. I believe that by this means I obtain more permanent results.

REFERENCES

1. Dolamore: Tr. Brit. Soc. Study Orthod., 1923.
2. Breitner, C.: Ztschr. f. Stomatol., February, 1930.

DISCUSSION

Professor J. C. Brash, Edinburgh, said that he would like, first of all, to congratulate Mr. Humphreys on opening up this very interesting subject, particularly from the point of view of the possibility that he has suggested of tracing growth changes in the jaws of the same individual by means of radiographs.

The last part of the paper was what interested him most. One of the great difficulties in determining what happens in the growth of the jaw either normally or under the conditions of treatment is to be able to compare the same individual at different stages.

When he mentioned that point, the story of Cromwell's skull always came to his mind. A certain museum in England (he would not disclose which one) exhibits Cromwell's skull "when a boy." That is really what is required in order to be quite certain about our deductions regarding the growth of the skull and the growth of the jaw. But he thought it was probable that with improvements in radiographic technic we could remedy that defect, and the special import of Mr. Humphreys' paper was that he had pointed the way in relation to changes that take place in certain parts of the jaw by treatment.

There is only one point that the speaker really wished to discuss and to establish his own point of view. Mr. Humphreys had shown on the screen certain outlines showing the position of the condyle before and after treatment. The thing that interested him most was what happened to that region during treatment. Now, it was a fundamental thing, in his view, to realize that the treatment which Mr. Humphreys was carrying out was taking place while these jaws are growing in a certain way; not only the mandible but also the glenoid cavity and the articular eminence. During the period of growth one of the fundamental things about the growth of the mandible is that the condyle is growing at a certain rate upward and backward. At the same time the articular cavity is growing downward and forward and the changes Mr. Humphreys traced from the more or less flat character of that region in the child to the adult condition with a well-developed articular eminence was due, of course, to the

enlarged arches and the growth of the anterior and posterior arches in that region. Both occur, but only the anterior part grows down. These two parts are growing at the same time, the condyle upward and the articular region downward, and of course the teeth are in occlusion. But the main part of the growth of the body of the jaw was the alveolar region. When Mr. Humphreys moved forward that jaw and brought the condyle on to that particular eminence, the molars come out of occlusion. Then what happened? In his (Prof. Brash's) view it was very obvious that the teeth came into occlusion again by the growth of the alveolar bone in the molar region.

Mr. Humphreys in reply said that Professor Brash's remarks were of very great interest. There was no man living who knew as much about the stages of the growth of the jaws as he did. He (the speaker) thought he could best utilize the short time at his disposal for reply by describing the technic employed in getting radiographs of the temporomandibular joint, in the hope that some of his audience would take similar records of their own cases. The sagittal plane of the head was kept parallel to the plate, and the joint nearest to the plate was the one to be photographed. The rays were directed through the brain to avoid the thick mass of the petrosal bone. A line was taken from the condyle to the mastoid process and on this as a base an imaginary equilateral triangle was erected. The apex would fall in most cases near the upper margin of the pinna, and to this point the rays were directed. Starting with the rays at right angles to the plate (i. e., vertically downward, if the plate is horizontal) their angle was altered 10 degrees forward (i. e., toward the face) and 10 degrees downward (i. e., toward the neck), keeping them still directed at the apical point of the triangle. The exposure was then made. With a little practice the undersurface of the glenoid cavity and the margin of the condyle could be clearly seen marked by a thin layer of compact bone.

XUM

FUTURE DENTAL EDUCATION*

BLAND N. PIPPIN, D.M.D., ST. LOUIS, MO.†

THERE is no more important subject to engage the minds of thinking men today than the character of education that is to be afforded in the future for adequate qualification of those who are to specialize in treating diseased conditions of the teeth and the oral cavity. This must be apparent to all who have come to realize the importance of the oral cavity in its relation to the health of the human body.

It is not the purpose of this discussion to endeavor to outline a definite course of instruction for the teaching of dentistry, but rather to point out the direction such a course should take, and the ultimate goal to which such instruction must eventually lead. It is not as important to consider what dental instruction has been and is today, as what it shall be in the future.

In planning dental education for the future, it must be for the definite and specific purpose of affording the most practical, efficient and scientific qualifications of those who are to engage in health service in whatever capacity.

Those who are to direct the trend of dental education must never lose sight of the fact that it is only as an agent of service for the health of mankind that dentistry can justly lay claim for maintenance and perpetuation. They should ever hold to professional ideals and be guided by a spirit of altruism that ennobles and distinguishes true professional men.

Service is the essence of importance in any line of human endeavor, and the question for our consideration at this time is, *how, and in what relation with the other branches of health service, can dentistry best function to assist in the conservation of the health of mankind?*

The question, "Is Dentistry at the Crossroads?" has been asked by the distinguished Dean of Columbia University School of Dentistry and Oral Surgery. This question can be answered in the negative. Dentistry is not now at the crossroads, but it was in 1839. It was then that dentistry was compelled to pursue its own course of development, and in consequence there has been established an honorable and universally recognized profession, travelling along a distinct health service highway of its own construction parallel to that of conventional medicine.

It is not now of any great concern whether or not it was a mistake that dentistry was then compelled to fight its battles alone. Neither does it follow that because it succeeded in achieving its present status without encouragement or assistance from organized medicine, that it should continue in its service to mankind by confining its operations to its own road.

Let us assume and believe that those who were responsible for the rejection of the pleas of Hayden and Harris to permit the teaching of dentistry in the

*Read before the American Association of Dental Schools, at Memphis, Tenn., March, 1931.
†From the Washington University School of Dentistry.

XUM

Baltimore School of Medicine were actuated by sincere convictions that such a policy would not be for the best interests of medicine as then constituted, or redound to the benefit of humanity which it was endeavoring to serve. Rather than lament or rejoice as to what happened then, let us honor Hayden and Harris and their associates for the bold, courageous stand they took, that was responsible for the development of dentistry to its present status as a recognized needful agent in administering to human ills.

Since those days, the teaching of dentistry, as well as its practice, has undergone marked changes. As time has passed, the opinions of Hayden and Harris that dentistry should be a specialty of medicine, have been adopted by the leaders in dental education, as is evidenced by the number of medical subjects that are embraced in its teaching, and the importance that is attached to them as forming the basis of dental education and practice. Dentistry, through its widened scope of research and its broadened field of practice, has reached that stage of importance on its highway of health service, that the strip of No-man's-land which stretches between the two great professional highways has been gradually but certainly narrowed, until today many of those who are responsible for the efficiency of dentistry in its professional endeavors are beckoning to the medical authorities to consider ways and means to merge the two health service systems into one great highway, that will embrace and pave with concrete of understanding the ribbon of prejudice and ignorance that now separates them.

How can this be done? Will building the dental highway up until it reaches a level of that of medicine and broadening its course to eliminate its portion of the useless territory between, be all that is required? Or must medicine too do some grading and reconstruction along her road? Is it not admitted by many medical educators today that the medical highway needs many elevations and depressions in its course obliterated to facilitate satisfactory operation of its many vehicles in health service? Is it not becoming known to medicine that ignorance on its part of the fundamentals of dentistry is detrimental to its efficient and successful service?

Dentists have long known that the basic sciences of medicine are indispensable to dentistry and that the fundamentals of dental science are equally necessary for medicine.

Is not therefore the medical profession chiefly responsible for the prejudice and ignorance that separate the two professions?

Has the time not yet arrived when the leading representatives of medicine should meet with the leading representatives of dentistry and together agree upon a common plan of education, whereby dentistry could take its rightful place along with other recognized specialties of medicine?

If this time has not yet arrived, it is incumbent upon the dental authorities to continue developing and improving the dental highway, and if necessary, do all the reclaiming and surfacing of the margin that separates it from medicine.

In the introduction of Bulletin No. 19 of The Carnegie Foundation for the Advancement of Teaching are to be found some very pertinent and significant statements. On page 10, . . . "Dentistry should no longer be ignored in medical schools, and its main health-service features should be given suitable attention

XUM

in the training of general practitioners of medicine. Antagonism between medicine and dentistry cannot be explained on any basis of public interest or advantage and has no justification on any sentiments that are worthy of respect, for both professions are agencies for health service and cannot render it faithfully on any other conditions than those of earnest and effective cooperation. The practice of dentistry should be made either an accredited specialty of the practice of conventional medicine, or fully equal to such a specialty in grade of health service.''

Again at page 12, . . . ''On the other side of the question raised above, it is plainly essential, from the point of view of public welfare, that, if dentistry cannot become an accredited specialty of the practice of conventional medicine, it should be made the health-service equivalent of an oral specialty of medical practice in continued independence of medicine, so far as organization is concerned. For the laity, the quality of health service rather than the recognition of traditions or partnerships pertaining to such service is the primary desideratum, and medicine or dentistry by any other name would be a service just as grateful. If dentistry, having been developed and established as an independent form of organized public service, can rise promptly to its opportunity to become the full health-service equivalent of an oral specialty of the practice of medicine and will do so in good order and without economic waste, as it appears to be inclined to do, then few would welcome the needless embarrassments and demoralizations that would follow an attempt to destroy progressive dentistry by forcibly including it in conventional medicine. If, however, dentistry as now organized should not wish to become or could not develop into the full health-service equivalent of an oral specialty of medicine, public interest would ultimately require the creation of an accredited specialty of medicine to render oral health service in conformity with all of the evident necessities of such practice.'' . . .

Again on page 14, . . . ''The outstanding deficiency of the science of dentistry has been its inability, hitherto, to discover methods for the general prevention of decay of the teeth and of diseases of the closely adjacent tissues. Scientific establishment of adequate means to these fundamental ends would revolutionize the practice of dentistry by eliminating the chief present occasion for it. Although these disorders are among the most common of all bodily ailments, they have received little attention from medicine. Dentistry, deeply absorbed in oral mechanics, and not versed in oral medicine, has been baffled by them, and until recently has been content to follow with repairs, reconstructions and replacements. The primary causes of dental decay and of peridontal disease appear to be hidden in the biologic secrets of the conditions or processes of dentition, nutrition, coordination, or oral variability. It seems probable the causative influences, whether related to defective dental development, impaired nutrition or discoordinations, or particular conditions of dental environment, or to all of them, will not be discovered until the medical sciences are used effectively to this end. When dentistry becomes equivalent to an oral specialty of medicine, its vision and effort, combined with biologic understanding and aided with methods of enquiry of corresponding adequacy, may be expected to bring these dental maladies into the realm of the completely preventable disorders, if that should

XUM

not prove inherently unattainable. Comprehensive and penetrating research in these relationships is a basic need for the universal promotion of human welfare."

In view of what may be justly considered a sound and logical analysis of the conditions prevailing, in regard to the status of dentistry as an agent in health service, and its relation to conventional medicine, at the time the Carnegie report was issued, it is rather disappointing that the author of the report should not have foreseen the impracticability of recommending a course for dentistry, to make it the equivalent of an oral specialty of medicine, instead of advocating a combined course of medicine and dentistry that would make dentistry an acknowledged specialty of medicine on a par with its accredited specialties.

Notwithstanding the many changes for improvement in dental education that have resulted from the Carnegie Foundation's survey and report, it is nevertheless lamentable that much confusion and disorder in dental teaching resulted and still continue because of the divided opinion among the various surviving dental schools regarding the proper curriculum to adopt and the required time to employ in teaching it, to achieve the ends that public health demands.

Again quoting from the report—"*Primary Educational Needs of Dentistry as an Equivalent of an Oral Specialty of the Practice of Medicine.*"

"Development of the art of dentistry into the equivalent of an oral specialty of the practice of medicine would require a new and more comprehensive definition of dentistry, a corresponding extension of the scope of dental health service, and commensurate improvement of dental education. Expanded as it should be in biologic scope and strengthened in all its health-service aspects, dentistry, then a learned profession, would be devoted in broad terms,

(a) to establishment of the principles, and
(b) to application, in all forms and degrees of scientific health service relating directly to the teeth and to the closely adjacent oral tissues, and indirectly to the welfare of the other parts of the body and of the whole system;
(c) to discovery of the correlations between dental and oral conditions and systemic diseases, with special reference to observed effects of distant disorders on the teeth and closely adjacent oral tissues, and of dental and oral abnormalities on the health of the body as a whole;
(d) to detection, and provisional diagnosis, of dental and oral symptoms that indicate the prevalence or imply the probable existence of ill-health elsewhere in the body; and
(e) to suitable, supplemental, advisory health-service, including consultation with the patient's physician, based on such observations (c) or diagnoses (d).

"In this view of an enlarged dentistry, its practitioners would be trained to give the service not only of dental surgeons and dental engineers as at present, but of oral sanitarians and oral physicians as well. Instead of examining the teeth and mouth of a patient, as is now usually the case in a restricted view of their responsibility, they would also suitably enquire into and keep careful records of the state of the patient's health; particularly as it affects or is modified by conditions of the teeth and mouth.

XUM

"Dentists would plan their procedures to meet not only the local indications but also the possible requirements of extraoral relationships; would also recognize and note the significance of outstanding symptoms of systemic disease, and warn or advise the patient accordingly, or explain his need for a physician's attention; and could effectively discuss, with a physician, the oral conditions in their relation to a patient's general welfare. Prevention of disease at all ages would become an inherent and predominant motive. The frequency with which dentists are, and will continue to be, consulted for oral health service gives them special opportunity and occasion to note not only the occurrence of oral and systemic diseases, but also the existence of correlations between them, and to help or guide patients accordingly."

For one to foresee so accurately the requirements and needs of dentistry and to state them so comprehensively and definitely, and at the same time claim such qualifications as being only equivalent to that of an oral specialist of medicine, is to exercise too modest claim. Indeed, such qualifications *are* those of an oral specialist of medicine. Then to advocate the well-known so-called 2-3-graduate plan (two years of college and three years of dentistry, with an extra year of graduate work, that is not compulsory and no one takes), to attain the qualifications of a specialist of medicine, is to flatter the capabilities of dental students, and to extol the effectiveness of dental teaching, that should excite the envy of all medical students who have a minimum of two years' college—and many of them four—and are required to attend four years of medicine and one or more years of special training in addition.

But granting that those taking the 2-3-graduate plan, if carried out to its full intent, should actually attain the qualifications of a specialist of medicine, or the equivalence of such qualifications, and that they should sincerely believe themselves specialists of medicine or that they possess equivalent knowledge of such a specialist, does that imply that medical graduates will so regard them?

Will the public have the same respect for their opinions as for those of acknowledged medical specialists?

Is not the public suffering today because of the lack of confidence the medical profession has in the qualifications of dentists? Are not the two professions handicapped in their efforts because of their inability to cooperate harmoniously? Are not the opinions of physicians dominant over those of dentists and do they not command superior respect from the public?

It may be claimed that if the health-service rendered by the dentist *is* equivalent in value to the service rendered by an acknowledged medical specialist, that the full purpose of dental education has been attained; but is this really true, unless the medical profession and the public acknowledge the equivalence? It can only be through such acknowledgment that medicine and dentistry can harmoniously cooperate, and without harmonious cooperation the public must suffer. Is it reasonable to expect that medicine and the public will regard dentistry equal in health service to a recognized specialty of medicine, when there is such a vast difference in the character of preprofessional as well as in professional training?

The zeal with which the 2-3-graduate plan was advocated and the determina-

XUM

tion to have it adopted are evidence of the faith of its author in its applicability to accomplish the high ideals of dentistry as set out in the Carnegie report; but experience has proved that not even Carnegie's heralded millions could have made it practical. Neither is it possible to attain these ends through the 5-year plan or the 1-4 plan. Through the 2-4 plan, they can be more nearly accomplished, but only if in this course the basic sciences of medicine have been thoroughly treated.

There are no plans of dental education in the world today that are designed to meet fully the demands of public health, and there are no plans of medical education that are complete without dentistry. The medical profession cannot always ignore the science of dentistry as being necessary in its teaching, but sooner or later it must embrace it. When that time comes, dentistry must not permit the mistake to be made that exists in Europe, where the necessary mechanical sciences have been largely disregarded. The mechanics in dental surgery that has to do with vital tissues is as dignified and as necessary as the mechanics in any other specialty of surgery. If the mechanics of dentistry is abhorrent to the medical mind, he must learn more about it to remove his prejudices.

The attempts to teach dentistry according to different plans should no longer be defended on the ground that dentistry is in a transitional stage. The time has arrived when the authorities in the dental educational institutions should agree upon a common plan that looks to advancement as rapidly as possible to a standard where medicine can embrace it.

As stated in the beginning of this discussion, no attempt to outline a curriculum for the teaching of dentistry would be made; but your essayist does feel that the time for the adoption of a uniform minimum standard of dental teaching has arrived. For the guidance of those upon whom the duty of preparing a curriculum may devolve, the articles, "What Is Dentistry?", a compilation by Alfred Owre, "Is Dentistry at the Crossroads?" by the same author, "Medical and Dental Education" by Milton C. Winternitz, and the included questionnaire and answers from deans and leading medical men of some of the great medical schools and clinics in the country, should be given due consideration.

QUESTIONNAIRE AND ANSWERS

For the purpose of collecting material that may be of service to me in presenting a paper before the American Dental Teachers Association who meet in Memphis during the month of May, I would like for you to express yourself on the following questions:

First: What is your reaction towards the elevation of dentistry to a standard whereby it could be recognized as a specialty of medicine?

Second: Do you believe that dentistry should be considered a specialty of medicine? If so, do you believe it possible to reorganize the dental and medical curriculum to bring about this relation? If you do not so believe, would you state your objections?

Third: Would you have any objections to having your opinions quoted?

An early response will be greatly appreciated by

Yours truly,

BLAND NIXON PIPPIN.

This is in reply to your questionnaire as to dentistry as a specialty of medicine.

Dentistry requires no "elevation" in order to become a specialty of medicine. It is, in the ultimate analysis, a specialty of medicine because the teeth are parts of the body and

the dentist is concerned with the maintenance of health and normal function of the teeth. In this sense it is as much of a specialty as surgery, obstetrics or otolaryngology, but by the same token physical education, nursing and dieteties might also be considered as medical specialties. The important question at issue is not the academic one of nomenclature or of professional degrees but of the character of training of the practitioner in the specialty concerned. In determining upon the character of training, the first consideration should of course be ultimate service to the patient who will be treated by the practitioner. If the accepted course of training of dentists as at present carried out is inadequate to prepare the dental practitioner to render adequate service, that course of training should be modified. It might be argued that the more prolonged, more scientific and more diversified the course of training, the better qualified would be the practitioner, but at the same time it must be realized that the capacity of the human brain is limited and that life is short. A profession which requires a course of training which is too greatly out of proportion to the ultimate returns will attract but few individuals to its ranks, and the public will suffer from a dearth of adequate service.

Most of the specialties which are generally recognized as those of medicine are of such nature that a thorough knowledge of the biologic sciences and of general medicine is required for the successful prosecution, and it is therefore wise that these subjects should have a place in the course of training. Dentistry as a medical specialty occupies an intermediate position. From the nature of the case the dental specialist does not have need for all that now comprises the required work of the basal medical curriculum. If the student were to take all of the required courses of the basal medical curriculum, he would not begin his practical work in dentistry until late in his career, furthermore he would not retain for long much that he has studied, for what is not used is quickly forgotten.

There is no more need for the dental student considering the detailed anatomy of the kidney or the functional physiology of the heart than there is for the medical student obtaining practical experience in prosthetic dentistry. The dental student will actually retain more and make better use of what he does retain if he pursues only courses which are designed especially for his needs. This does not imply that the courses designed for dental students should be of any lower standard than those for medical students. They should, however, be different. There is no very good reason why *every* dentist should be a trained physician. He should, it is true, be familiar with the fundamental facts concerning nutrition and its relationship to the teeth. He should be familiar with the principles of bacteriology and the pathology of inflammation and the special pathology of teeth and bones. He should be thoroughly familiar with the principles of surgical asepsis and the interpretation of x-ray pictures.

He should know something about those general diseases which bring about oral pathology. These fundamentals and a few others he will make use of in his every day practice of dentistry. Even if he has studied more of the medical sciences and of medical practice, he will not have the opportunity of putting the knowledge so gained into sufficient use to remain proficient. He will do better to consult an internist when problems arise which are beyond his field of every day practice. Nothing is to be gained by converting a first class dentist into a mediocre medical practitioner.

In view of the foregoing considerations, I do not believe it is practical to unify the dental and medical curriculum so as to provide for the same training of dentists and physicians during any considerable part of their academic careers. No very good purpose would be served by providing the same training during the first two years of the professional course during which the fundamental biologic sciences are covered because this would only meet the situation in an inadequate manner, inasmuch as some knowledge of clinical medicine is of equal importance to a knowledge of the medical sciences. It is difficult to state where the line should be drawn, for the dental student could probably profit by about one-third of the work ordinarily comprised in courses in the fundamental sciences in medical schools and perhaps by one-fourth of the work given during the clinical years. If he were required to pursue the entire medical curriculum with the exception of the specialties and were permitted to substitute practical dental work for all of the specialties, there would not be sufficient time in a four-year course for him to attain the high degree of technical skill and manual

XUM

dexterity which is essential to the practice of dentistry; nor would he have the time for proper consideration of purely dental subjects. This would inevitably require a prolongation of the dental course to an impractical length and I am not at all sure that the ultimate product of such a course of training would be superior.

Dentistry is a very specialized field of medicine which has already been elevated to a standard of professional excellence entirely comparable with that of other medical specialties. The average American dentist is at least as well qualified to render adequate service in his field of work as is the average otolaryngologist, ophthalmologist or surgeon. Dental education in America has been notably effective and that is to the credit of the profession. There is, of course, always room for improvement in any form of education, but changes should not be made at the expense of that which has been found good through long practical experience. More medical science and more clinical medicine, or preferably better science and better clinical medicine might be introduced into the dental curriculum but this should not be done at the expense of practical dentistry. Likewise, the medical curriculum would be improved by the introduction of courses covering the fundamental aspects of dentistry. I am, however, entirely unconvinced that any plan for the unification of the dental and medical curriculum will result in the training of better qualified dentists. Dentistry is a profession which has become firmly established in its own right and one which comprises a number of specialties. It would lose much by becoming a minor subdivision of medicine. It had best retain its independence.

I have no objection to having my opinions in this matter quoted.

Yours very truly,
(Signed) W. McKim Marriott, M.D.
Dean of Washington University School of Medicine.

In reply to your letter of January 23 Dean Winternitz has asked me to forward to you the enclosed reprint on *Medical and Dental Education.* If you wish further information, please let us know.

Very truly yours,
(Signed) Constance D. Weeks,
Secretary to the Dean of Yale University School of Medicine.

I am returning herewith your questionnaire of January 23. I do not consider that I am sufficiently informed about problems of dental education or of dentistry in general to express an opinion on the questions raised in your letter. It is a subject to which I have given almost no thought, and I do not feel justified in expressing an opinion. I hope that you will understand my position in the matter.

Sincerely yours,
(Signed) Alan M. Chesney,
Dean of Johns Hopkins University School of Medicine.

I have given considerable thought to your communication of January 23. I believe that the ideal plan would be to develop dentistry as a specialty of medicine, but that it would be unwise for a long time to make that move. It would certainly be a too radical departure from the present generally accepted curriculum and I am sure would work great harm to dentistry as a whole if such a plan were put through now. The gap between the present curriculum and the suggested one would be too great. If experiences in other educational matters are worth anything, changes in the curriculum of dental schools should be brought about slowly but steadily. If the jump from the present curriculum to that of making dentistry a specialty of medicine should be made all at once, I doubt very much whether many students would go on with their original plan of taking up dentistry if they once finished the medical course.

XUM

I have thought for a long time that the dental curriculum should include a rather complete course in internal medicine relating to diseases of the entire gastrointestinal tract. I also believe that much more attention ought to be paid to the subject of stomatology. These suggestions presuppose that the preclinical courses should be strengthened, especially physiology and pathology.

I have no objection to being quoted.

Sincerely yours,
(Signed) HARVEY J. HOWARD,
Washington University Department of Ophthalmology.

Replying to your letter of January 23rd, 1931, my answers to your questions are as follows:

1. What is my reaction towards the elevation of dentistry to a standard whereby it could be recognized as a specialty of medicine?
   My opinion is that this is desirable.
2. Do I believe that dentistry should be considered a specialty of medicine?
   Yes.
3. If so, do I believe it possible to reorganize the dental and medical curriculum to bring about this relation?
   Yes.
4. Would I have any objections to having my opinion quoted?
   No.

Also I am sending you enclosed copy of my letter to Dr. Alfred Owre, Dean, Columbia University School of Dental and Oral Surgery which I think will be of interest to you in your present endeavor.

Sincerely yours,
(Signed). LANGLEY PORTER, M.D., Dean,
University of California Medical School.

COPY

January 2, 1929.

This is to acknowledge the receipt of your interesting letter of December 28, 1928. I am in complete accord with Dean Winternitz in his opinion of the route dentistry should take for its future, also in his view that the present situation is absurd. It seems to me that a change is bound to overtake the spirit of medicine, and that when this change takes place, it must necessarily involve the practice of dentistry and the methods used for instruction in it. More and more the physician is coming to be the administrator of a group of technicians which he uses for the benefit of his patient, coordinating their skill with his own knowledge in a diagnostic and therapeutic service. The physician must know how best to use the abilities of the chemical, bacteriologic, radiologic, physical technician, the nurse, the physiotherapist, the psychologist and other technicians, and there is no reason why the surgeon trained as a specialist in dentistry should not be able to direct the skilled work of dental technicians who had mastered the details of the technic of porcelain work and vulcanization. Not only will the very important phases of preventive medicine involved in the relation of oral to constitutional diseases lag until this reform is achieved, but, in my opinion, there will be little real advance in reducing the cost of medical care until organization of technicians directed by wisely educated medical men is accomplished.

I am, my dear Doctor Owre,

Sincerely yours,
(Signed) LANGLEY PORTER, M.D., Dean,
University of California Medical School.

First: What is your reaction towards the elevation of dentistry to a standard whereby it could be recognized as a specialty of medicine?

Answer: I'm in favor.

XUM

Second: Do you believe that dentistry should be considered a specialty of medicine? If so, do you believe it possible to reorganize the dental and medical curriculum to bring about this relation? If you do not so believe, would you state your objections?

Yes.

Third: Would you have any objections to having your opinions quoted?

Answer: No.

DR. ARTHUR I. KENDALL, Prof.,
Research of Bacteriology, Northwestern University Medical School.

Much as we might desire dentistry to be reattached to medicine, and thus become one of its greatest specialties, I do not believe it can be accomplished at the present time. Nearly all of the present teachers of dentistry are educated in dentistry but not in medicine. In years to come the alumni of the dental schools may force the schools to have professors educated in medicine as well as dentistry. When this is accomplished medicine and dentistry may at least become more closely associated. For the time being we must endeavor to secure greater cooperation between medical men and dentists in the study of chronic and recurring diseases.

Yours very truly,
(Signed) DR. CHARLES H. MAYO,
Rochester, Minn.

I would not favor elevating, or I would prefer to say classing, dentistry as a specialty of medicine, unless the dentists went through the same preparations as other specialists; namely, the complete regular medical courses, before they started with their dental training.

I believe that such a preparation is not needed for the bulk of the dental work, and it would waste a great part of a very expensive training; and would impose an unnecessary and harmful financial hardship on the public. It would probably result in less dentistry, and possibly poorer dentistry, instead of better dentistry.

I have no objection to being quoted as an individual, but this should be done without title, as I have no authority to represent the faculty in the matter.

Very truly yours,
TORALD SOLLMANN, Dean,
Western Reserve University School of Medicine.

I have given considerable thought to the relationship between medicine and dentistry both because of my relation to both types of education here and of my long acquaintance with Dean Owre, now gone to Columbia, who of course is very anxious to bring a change along the line of which your letter deals.

It has always seemed to me unwise to advocate that dentistry be a specialty on top of the medical course, that is to require a previous M.D. like ophthalmology or the other medical specialties. This would be entirely satisfactory if it could be brought about that a large amount of present so-called dentistry could be done by technicians under the direction of a specialist with the type of training I have outlined. It has seemed to me, however, that the word "dentist" has become so thoroughly established in its present connotation and the present type of dentistry has become so thoroughly entrenched in the statutes of the various states that it will be impossible to bring this about. In fact I should rather leave the word dentist to indicate this technical person of more practical training, the need of whom is universally acknowledged, and build on top of this the medical-dental specialist who would be parallel with the ophthalmologist, the general surgeon and the other medical specialists. In its essentials this means that the man going this way should have the entire medical course and such parts of dentistry as he may need (perhaps all of it); but it means, I should say further, that a sympathetic arrangement between medical and dental schools could somehow shorten the time for the two degrees.

XUM

We have one man registered in the University of Minnesota for both degrees, although in such a case I do not see the necessity of more than one degree more than I would for an ophthalmologist. What would be more in keeping with the Minnesota system would be a graduate course laid out on top of the M.D. degree leading to a special degree in mouth surgery.

I have no objection to having my opinions quoted but can say that I do not think they are worth very much. I do not think any one has worked this out to a workable solution. Perhaps the suggestion I just made of a graduate degree is the best one which has come my way.

Sincerely yours,
(Signed) E. P. TYON,
University of Minnesota School of Medicine.

This is in reply to your letter of January 23, 1931, asking for my opinion on certain questions relative to the teaching of dentistry.

First: I am most heartily in favor of elevating dentistry to a standard whereby it could be recognized as a specialty in medicine. I am inclined to favor calling the specialty stomatology, which will include, of course, dental as well as oral health service.

Second: I do believe that dentistry and other oral health service, which should be combined with it, should be considered a specialty of medicine. I think that it is quite possible to reorganize the dental and medical curriculum to bring about this situation.

Third: I have no objection to having my opinions quoted. It should be understood, however, that these are my own opinions and naturally there would be others in our school, as in other schools, who would have contrary opinions.

Yours very truly,
(Signed) C. C. BASS, M.D., Dean,
Tulane University of Louisiana.

In view of the trend of thought expressed by many leading medical authorities as well as of dentists, I confidently believe that the time is not far distant when for the better service of mankind, dentistry with medicine must be united into one scientific body, one profession inseparable.

XUM

SOME VARIATIONS IN THE FACTORS OF MALOCCLUSION AND THEIR RELATIONS TO TREATMENT*

ANDREW FRANCIS JACKSON, D.D.S., PHILADELPHIA, PA.

ORTHODONTIA is concerned with a number of well-known factors, each of which is subject to innumerable variations, so that the combinations which these factors, plus their variations, are capable of producing are infinite in number.

As yet I know of no one theory or system of diagnosis or treatment which is broad enough to include all the factors with their variations and combinations which must necessarily be considered in order to arrive at any definite scientific solution to the problems involved. I feel, however, that one of the most fatal mistakes an orthodontist can commit is to try to make his cases fit a theory or system of treatment (particularly of a mechanical nature), rather than to accept (on suspicion) whatever there is good or sensible in any of them in its relative value. The power to discriminate in this particular, however, can only be acquired by much personal experience and thought.

In a subject of this kind our real knowledge is mainly acquired through the laborious and often painful method of experiment, trial and error. This is a perfectly legitimate method of scientific approach and, in view of the nature of orthodontic treatment, the most valuable.

In the nature of things, therefore, I believe that the most valuable contribution any orthodontist can make to the general fund of reliable information is to present the results of his experiences in such a manner that the decisions he is obliged to make in his own cases and the action or treatment which followed can be most clearly analyzed. This should be done with the greatest possible directness and simplicity and without fear of sincere and justifiable criticism.

The results of practical experience can usually be embodied in certain concrete general principles which are applicable to a vast variety of individual cases, and the object of this paper is to present these in the simplest possible form by a description of their application to a selected number of case reports from my own practice, which comprise in themselves many of the decisions which necessarily had to be made.

The object is not so much to show the results obtained as to show the particular method of mental approach which I have found to be the most reliable guide in arriving at some estimate of the factors involved.

The factors with which we are mainly concerned are heredity, growth and development, function, anatomic proportion, and certain abnormalities peculiar to the dental organs. Taking these factors into consideration, possibly the nearest we can arrive to an objective of treatment is: "The best arrangement of the dental organs possible within the biologic, functional and esthetic limitations to

* A paper presented before the Second International Orthodontic Congress, London, July, 1931.

produce the most efficient and artistic ensemble which will remain in a state of permanent balance after treatment is completed.''

As a first general principle I believe that there is no better method of evaluating the factors involved than by a thorough personal study of the living subject, allowing the fullest freedom to the powers of imagination and visualization. Success in practice depends from first to last upon personal judgment in evaluating the factors with their variations to a comprehensive whole and allowing nothing to interfere with the free exercise of this judgment.

As the first step, therefore, some experimenting should be done by getting the patient to occlude the jaws in as near the position of so-called normality as possible and noting the interference which may happen to be present which prevents the patient from doing so habitually. Orthodontia is not concerned with statics but with dynamics. This simple procedure will usually disclose obvious facts of such simplicity but far reaching importance that the first step in mechanical interference will usually immediately suggest itself as a logical sequence. If this basic principle is adhered to at each visit of the patient, from first to last, it will often dispose of that perplexing problem of ''what to do next,'' and will act as a beacon light throughout the whole course of treatment.

A general principle which I feel to be of the utmost importance is always to consider the relationship of the jaws from the standpoint of a unit and never to undertake individual movements of teeth of one jaw or changes in the relationship of the jaws without due consideration for compensatory and complementary movements of the opposing jaws. These movements should always be carried on simultaneously so that at all times during treatment the minimum amount of trauma may be produced.

One of the most essential faculties which an orthodontist must develop is the capacity to visualize in the vertical as well as in the horizontal plane. This faculty, combined with the general principle that form and function go hand in hand, will overcome one of the great stumbling blocks in treatment and of itself usually suggest the most desirable form of mechanical interference to be employed.

A general principle never to be forgotten or underestimated is the fact that we are at all times dealing with vital, living tissue subject to the intelligent control, through the voluntary muscles, of the individual upon whom the work is being done and that the form of mechanical interference should often be designed merely as an aid or a reminder to the individual of what the correct function should be.

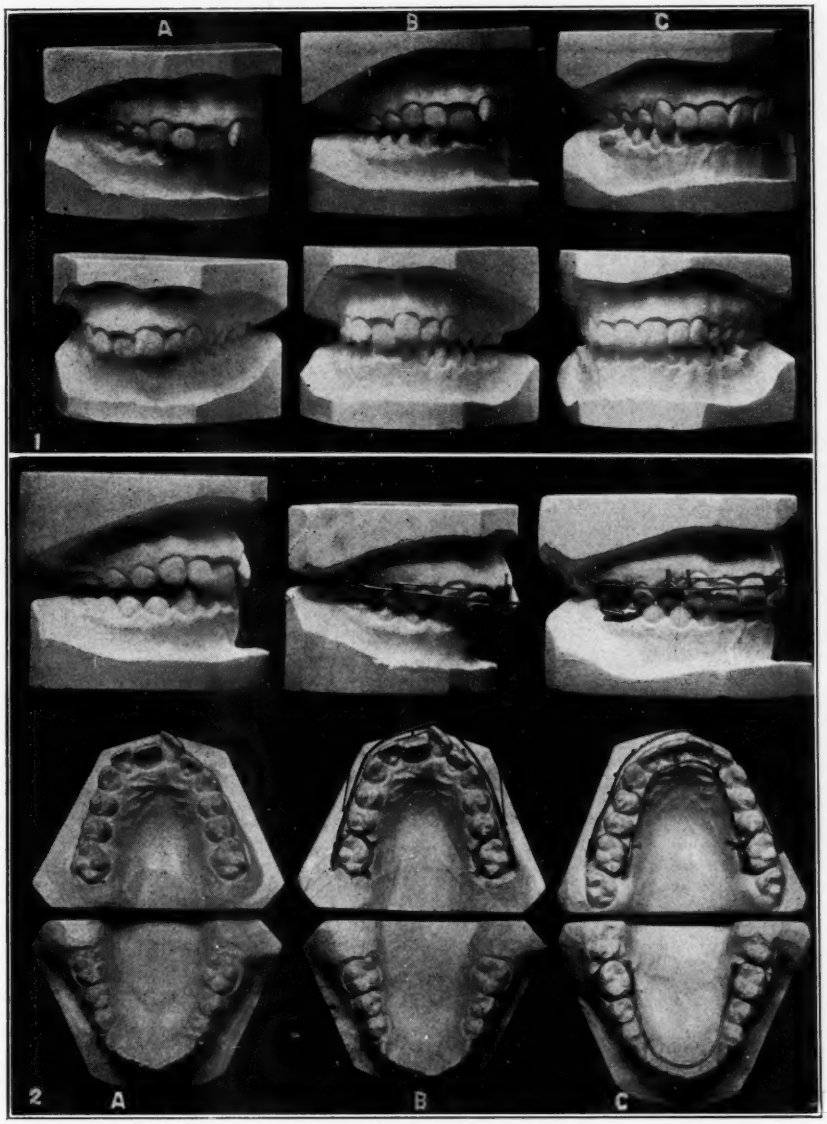
From the standpoint of treatment, the proportion of tooth substance to jaw development is basically a biologic and esthetic problem. The rearrangement of the teeth is basically a mechanical problem. The relationship of the jaws to each other is basically a functional or physiologic and psychologic problem.

Mechanical interference, per se, is concerned with and must be properly correlated to a number of very subtle problems which unfortunately cannot be accurately estimated scientifically. These might be stated as: the limit to which artificial stimulation can be successfully carried; the age at which treatment is most desirable; the length and rate of treatment; the histologic nature of the bone to be treated and the effect of mechanical stimulation upon it; the sizes

XUM

and muscular tensions of the oral cavities to be treated; the muscular and mental capacities and controls of the individuals to be treated; the selection of the most suitable appliances for the individual cases to be treated.

In the description of these case reports the mechanical appliances will be described very briefly, as they will be fully covered in my demonstration.



Figs. 1 and 2.

Case 1.—Fig. 1 *A* shows the right and left sides of a case of unilateral distoclusion of the right side with supraclusion and malposition of the incisor teeth.

The first decision in this case was that a normal occlusion (with a full complement of teeth) was biologically possible and artistically desirable.

Fig. 1 *B* shows the right and left sides of the case with the teeth placed, despite their malpositions, in as near the position of normal jaw relations as

possible. This immediately discloses the fact that the immediate cause of interference is the position of the maxillary right central and left lateral incisors. Therefore, the first logical step in treatment is to remove this interference. This was accomplished by means of the appliance shown in Fig. 2 *B*. A labial arch with labial auxiliary springs was employed as shown.

The immediate result of this treatment was to move these teeth labially and distally, thereby removing the interference and creating space for the rotation of the left central incisor. At this point a maxillary lingual crib was inserted as shown in Fig. 2 *C*. This performed the dual function of maintaining the right central and left lateral in their new positions and forcing the patient to bite forward in order to find a comfortable place to occlude the teeth. At the

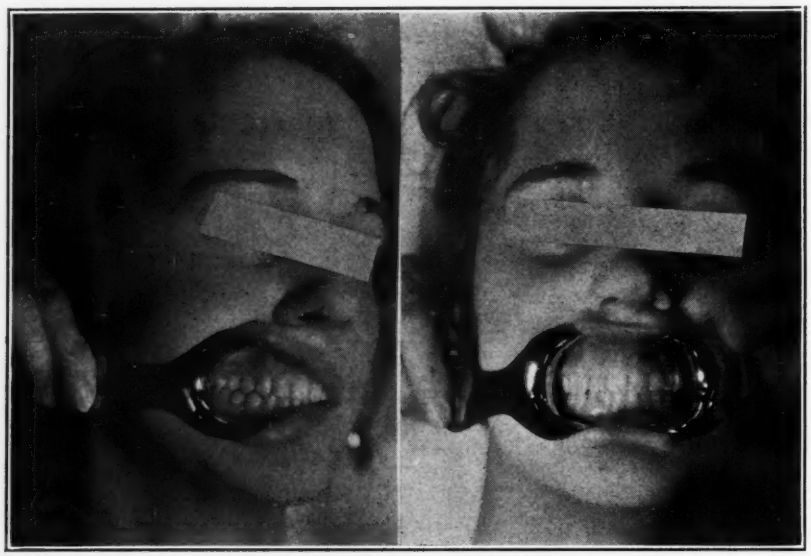


Fig. 3.

same time, the maxillary right first premolar was banded and the labial arch ligated to this; also illustrated in Fig. 2 *C*. The maxillary left central incisor was banded and an auxiliary spring soldered to this band and sprung under a knob soldered to the labial arch; also illustrated in Fig. 2 *C*.

A mandibular lingual arch was inserted and intermaxillary elastics were used, on the right side only, in order to swing the mandible forward and to the left. The action of these elastics also drove the right maxillary molar slightly distally and created spaces between the teeth on the right side. These teeth were then individually moved distally with auxiliary springs until the normal relation of the teeth and jaws was attained.

The case was then retained by means of an adjustable retainer on the maxillary teeth. The final result is shown in the models in Fig. 1 *C*, and in the photographs of the patient in Fig. 3. The time consumed in the entire active treatment was one and one-half years.

Case 2.—Fig. 4 *A* illustrates a case of neutroclusion involving the partial impaction of the mandibular right premolar, a drifting of the mandibular incisors to the right side and general constriction of the maxillary and mandibular arches.

XUM

The first immediate problem again involved the decision that a normal occlusion, with a full complement of teeth, was biologically possible and artistically desirable. The first mechanical problem was the question of creating space between the mandibular right molar and canine for the accommodation of the second mandibular right premolar. To accomplish this a mandibular labial arch was inserted with a labial auxiliary spring acting on the mandibular right canine to move this tooth mesially and labially. At the same time an auxiliary spring was used to move the mandibular left canine buccally and distally.

The action of the labial auxiliary springs always causes the teeth to which they are attached to move slightly in the direction of the points of attachment of the springs.

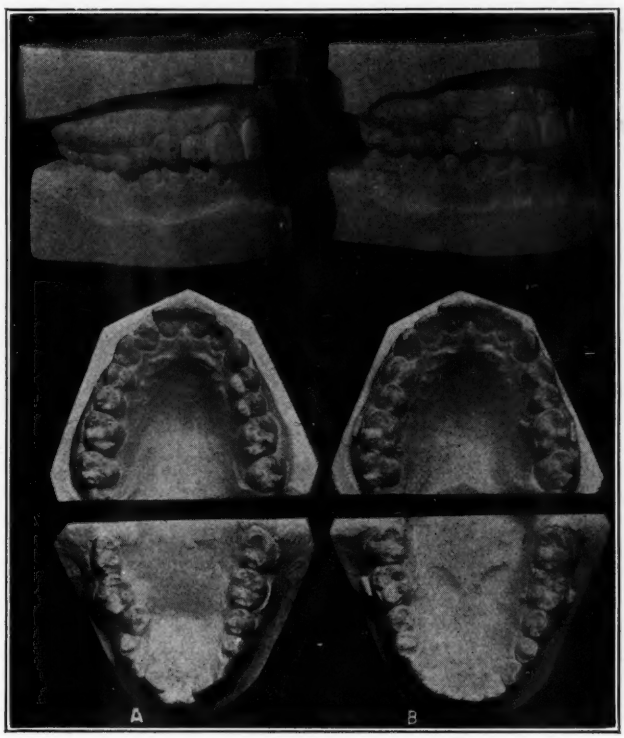


Fig. 4.

Simultaneously with this treatment on the mandible, a labial arch was inserted on the maxilla with auxiliary springs attached to the maxillary canines; causing these teeth to move buccally and slightly distally. This coordinated the movements of the teeth on each jaw to each other. This simultaneous action avoided the traumatic occlusion which might otherwise result from a disregard of this basic principle. Simultaneous expansion of the maxillary and mandibular labial arches was also employed to move the maxillary and mandibular first permanent molars buccally and again avoid traumatic occlusion during the movement of these teeth.

After sufficient room had been obtained in this manner for the accommodation of the teeth and the correct artistic proportion of the arches, two lingual arches were inserted. Lingual auxiliary springs were attached to these to carry

the maxillary and mandibular premolars into their correct positions. A few minor adjustments were also made to align the mandibular incisor teeth. After which a lingual bite plane was inserted in the maxillary arch to produce the correct vertical arrangement of the teeth.

The total length of active treatment was slightly less than one year, and the patient is at present using for retention a mandibular lingual arch lying under knobs soldered on bands on the mandibular lateral incisors and an adjustable bite plane retainer on the maxillary arch.

The appliances used are illustrated in Fig. 5.

The completed case is shown in Fig. 4 *B*.

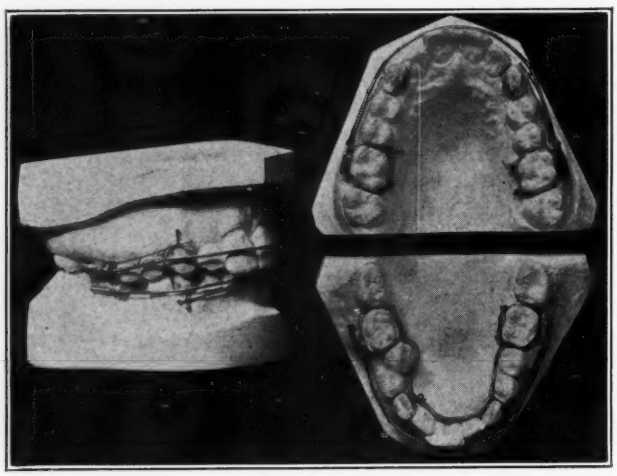


Fig. 5.

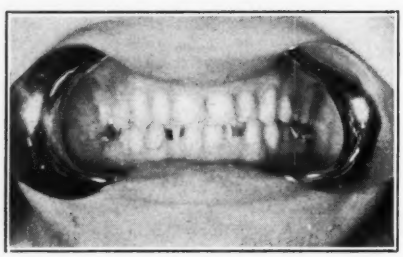


Fig. 6.

A photograph of the patient's teeth, after treatment was completed, is shown in Fig. 6.

CASE 3.—Fig. 7 *A* and *B* show the models of a case of neutroclusion before and after treatment. *A*, before treatment, shows a condition of considerable constriction of the arches complicated by extremely large maxillary incisor teeth. In the mandibular arch the right lateral incisor was in apposition with the first right premolar; the mandibular canine lying labially directly in front of the right lateral.

It is a difficult thing to visualize at an early age what the final result will be in cases of this kind. I decided, however, to produce the expansion necessary for the accommodation of all the teeth, and I believe that Fig. 8, which is a photograph of the patient after completion of the work, justifies the belief that

XUM

my decision was correct. It will be noted that there is no apical constriction of the bony substance around the roots of the teeth and that the proportion of tooth substance to facial development is pleasing.

Mechanical interference similar in principle to that employed in Cases 1 and 2 was used.

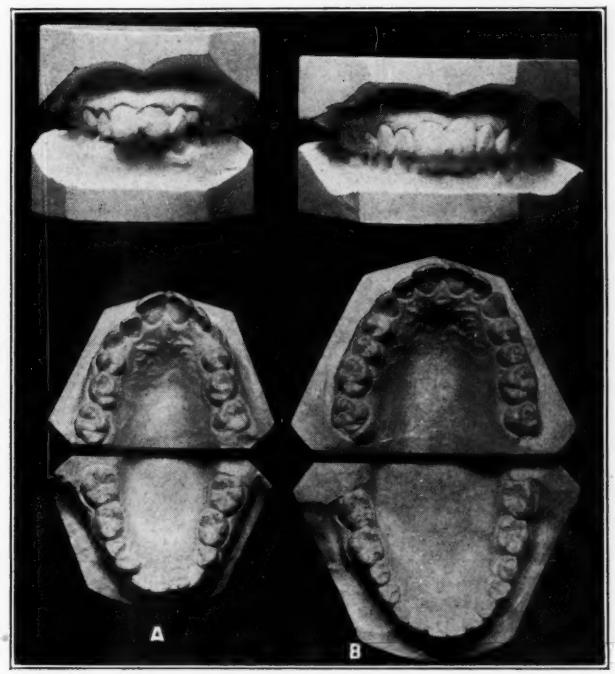


Fig. 7.

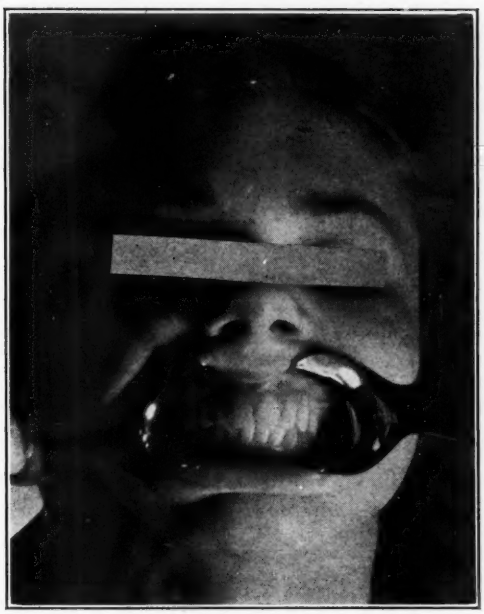


Fig. 8.

Fig. 9 *A* is a photograph of the models of the teeth of the girl illustrated in Fig. 8, shown side by side with the completed models in *B*, of the teeth of the girl illustrated in Fig. 10. These are used simply to illustrate the vast difference in

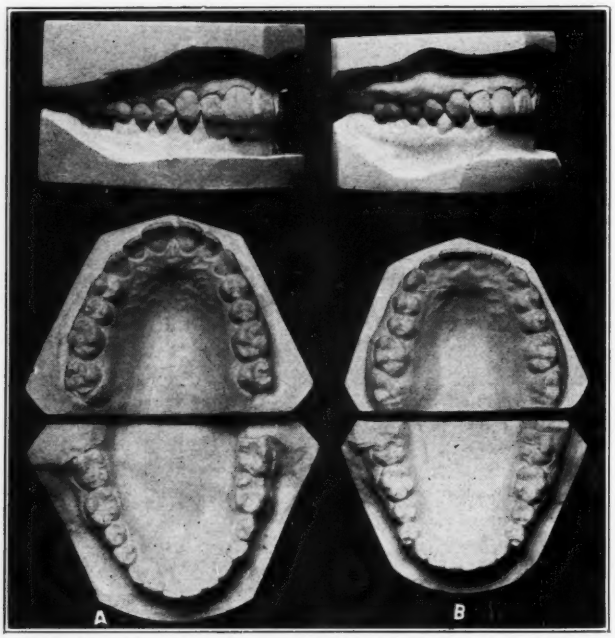


Fig. 9.

Fig. 10.

proportion that may exist in the sizes of teeth which may yet, individually, constitute parts of a harmonious whole.

Case 4.—Fig. 11 illustrates the models of a case of neutroclusion complicated by constricted arches and crowded incisors in both maxilla and mandible.

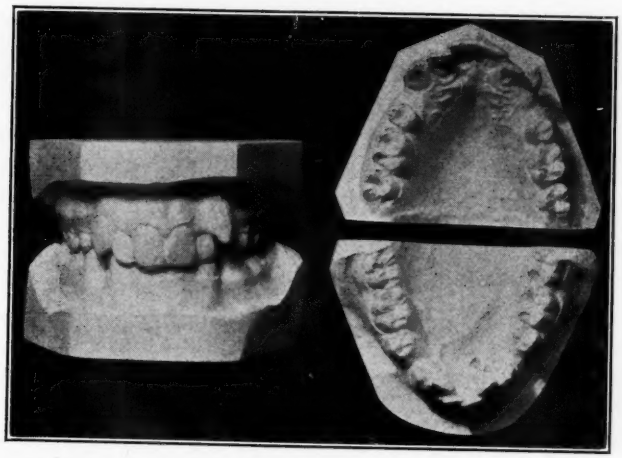


Fig. 11.

Fig. 12.

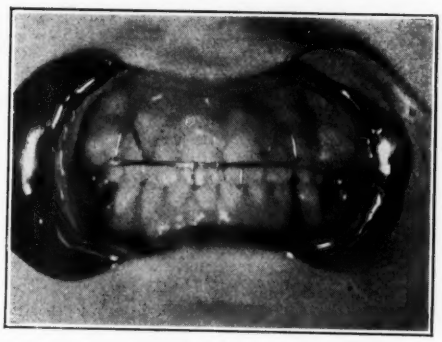


Fig. 13.

This case involved a difficult decision. After taking all the factors into consideration, the extraction of the maxillary and mandibular first premolars was finally decided upon. This decision was mainly made through the insistence of the child's parents.

Fig. 12 shows the results after the treatment was completed, which are a justification, in themselves, for my action in allowing these teeth to be extracted. I believe that the artistic harmony is far better than if an attempt had been made to place all the teeth in position, and I have very serious doubts whether it would have been biologically possible to maintain these teeth, in satisfactory occlusion, had it been attempted. My reasons for this are that, notwithstanding the extraction of these teeth, there is still apical constriction due to lack of bony development; and my experience in the moving of these teeth, as well as the experience

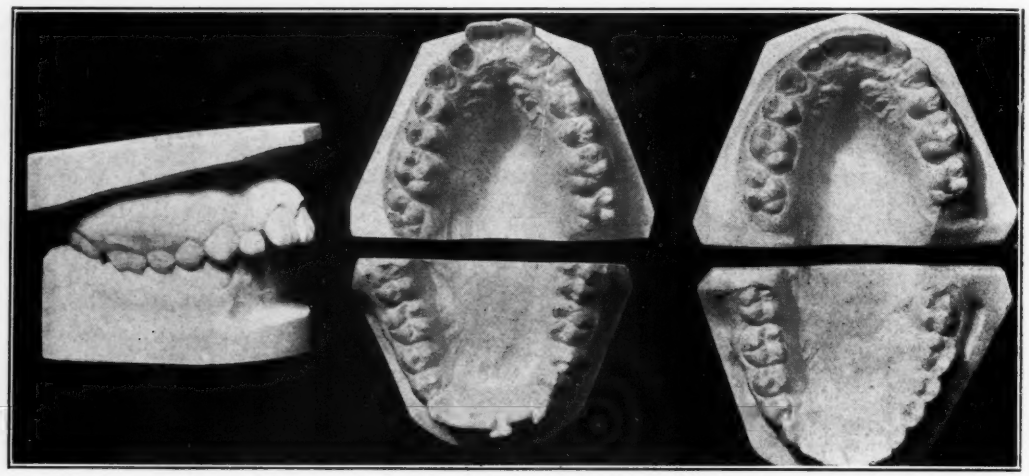


Fig. 14.

I had in the treatment of a brother of this patient, leads me to believe that there is a peculiar condition of bone density in this particular family.

Conversations that I have had with Dr. Churchill, histologist of the Dental Department of the University of Pennsylvania, corroborate my opinion that there is a great difference in the bone density of individuals, a factor which must always be considered in treatment and upon which we have very little definite data at present.

Fig. 13 shows the appliance in place which was used to a great extent in moving the canine and laterals distally. This is mainly an adaptation of Crozat's recurved springs, adapted to fixed appliances, which he has used so successfully with his particular forms of removable appliances.

Case 5.—Fig. 14 represents a case of distoclusion with extreme labial version of the maxillary incisors, complicated by crowding of the mandibular incisors and a condition of open-bite.

In this case, the decision was made to extract the maxillary first premolars only and the result of the treatment is shown in Fig. 15 *A* and *B*.

Fig. 15 *A* shows the face in repose after the treatment was completed, and Fig. 15 *B* the occlusion of the teeth after the treatment was completed.

XUM

This patient presented for treatment at a rather late age, about sixteen years old, at which time many of the functional habits of the individual had become firmly fixed and therefore much less amenable to permanent change than if treatment had been instituted at an earlier age. It will be noted that the upper lip is exceedingly short, so that the maxillary incisor teeth are constantly exposed, notwithstanding their retraction made possible by the extraction of the premolars. What the condition was, before the extraction, can well be imagined. (I regret that photographs were not made of this patient before beginning treatment.)

In common with all open-bite cases, the habit of constantly playing the tongue between the teeth was also firmly established. It has been my experience that the use of intermaxillary elastics, even when most carefully employed,

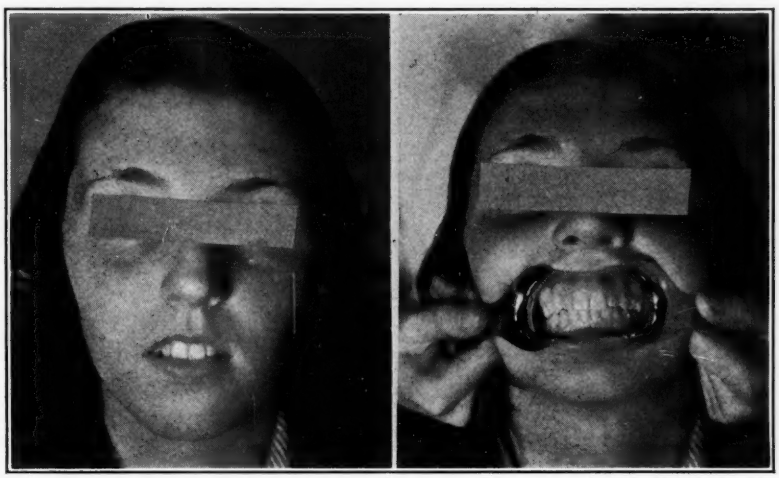


Fig. 15.

always has a grave tendency to aggravate open-bite conditions so that their use in this case might have produced disastrous results. Therefore, I felt justified in having pursued the treatment outlined.

This case is presented to show a combination of factors which requires great delicacy of judgment in evaluating their relation to each other to produce a result which would be a satisfactory compromise, feasible of attainment.

Case 6.—Fig. 16 *A* shows a typical case of bilateral distoclusion. Fig. 16 *B* shows the teeth placed in as nearly the position of normal occlusion as the malrelation of the teeth and jaws would permit, disclosing the fact that the most important factor to be considered is the vertical arrangement of the teeth. Appliances very similar to those used in Case 1 were employed, with the difference that intermaxillary elastics on both sides were used. The maxillary lingual bite plane was pinched bilaterally with the wire stretching pliers at intervals of from four to six weeks, thereby reminding the patient constantly to bite further forward of the position which had become habitual, and this was continued until the normal relation, both anteroposteriorly, and a normal vertical arrangement of the teeth was acquired. Simultaneously with this, slight rearrangement of the incisor teeth was effected, producing the result shown in Fig. 16 *C*.

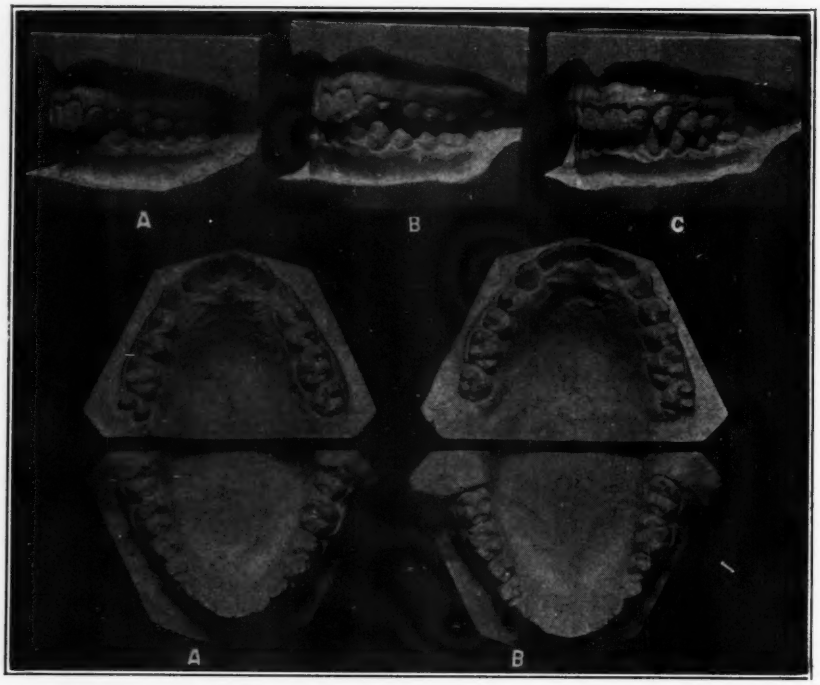
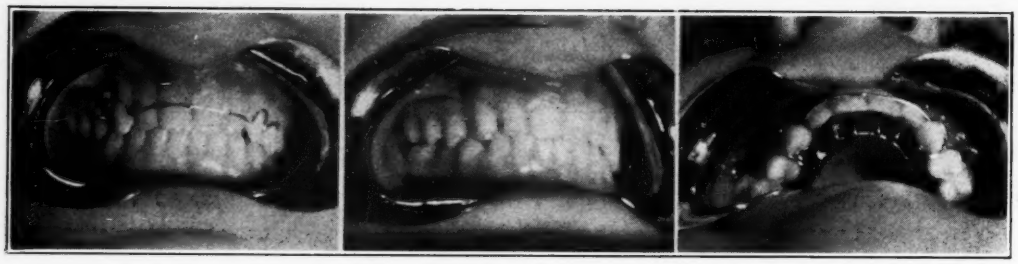


Fig. 16.



A B C

Fig. 17.

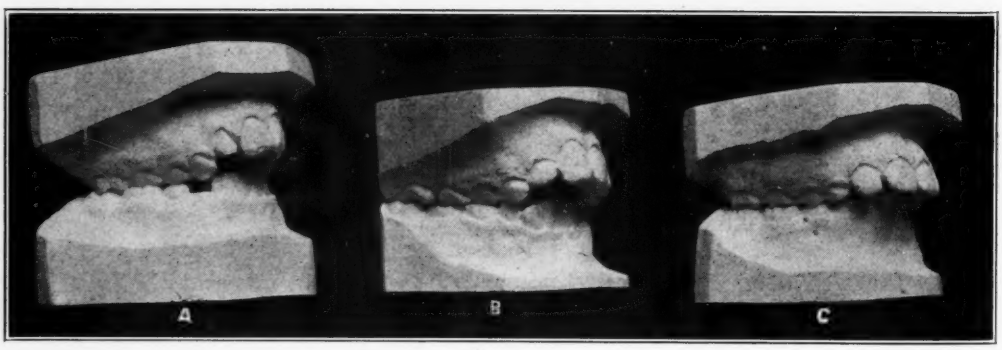


Fig. 18.

XUM

Fig. 17 *A*, *B* and *C* show photographs of the patient's teeth after treatment was completed. Fig. 17 *A* shows the labial aspect of the teeth with an adjustable bite plane retainer in place and Fig. 17 *C* the lingual aspect of the same. This particular appliance I have found of extreme value in maintaining the correct bite until the tissues have thoroughly adjusted themselves to the new relation.

Fig. 18 *A*, *B* and *C* show three cases of open-bite in young patients, complicated with distoclusion. Open-bite cases constitute, I believe, the *bête noir* in orthodontia, and much has yet to be done to arrive at some definite conclusions as to the etiology of these cases. In my own experience the remarks made to me

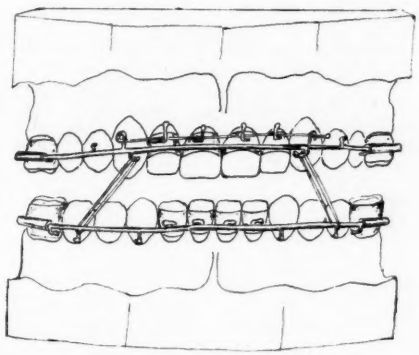


Fig. 19.

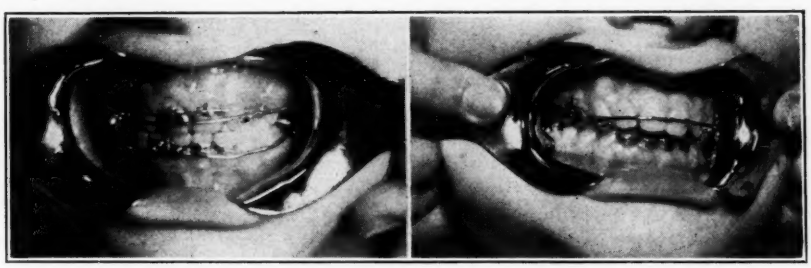


Fig. 20.

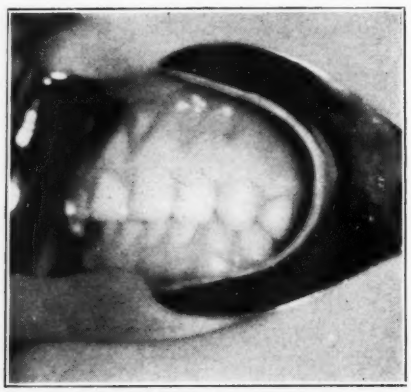
by Dr. Delabarre of Boston, of his observation of these cases, have been most valuable in my efforts in treatment. It is his opinion that all these cases are associated with the pernicious habit of tongue sucking or at least the constant habit of the tongue playing between the teeth. Treatment is based on the fundamental principle that form and function go hand in hand. If the bite can be closed by mechanical means and the tongue habit corrected, it is possible to obtain permanently satisfactory results. My own experience is to corroborate 100 per cent Dr. Delabarre's opinion.

The mechanical appliance employed to treat these three cases is illustrated in Fig. 19.

Fig. 20 *A* and *B* are photographs of the patient's teeth, the models of which are illustrated in Fig. 18 *A* and *B*. The results of the mechanical treatment and the types of appliances used can be noted.

In combination with this mechanical treatment, however, most strenuous efforts must be employed to induce the patients to correct their tongue habits.

It will be noted that when these patients swallow, the act is accompanied by forcing the tongue between the incisor teeth. The way to draw the patients' attention to this incorrect function, is to ask them to articulate the word "Kate" (also suggestion of Dr. Delabarre's). It will be observed that in articulating the word "Kate" the tip of the tongue is placed on the palate just posterior to the maxillary incisor teeth, which is the correct position it should occupy in the act of swallowing normally. If this lesson can be thoroughly drilled into these patients, the first great step in the correction of these troublesome cases will be accomplished.



A

B *C*

Fig. 21.

Fig. 21 *A* is a photograph of the occlusion of the patient corresponding to the models shown in Fig. 18 *C* two years after all appliances were removed, and Fig. 21 *B* and *C* are photographs of this patient before and after treatment.

Fig. 22 shows the photograph of the occlusion of a young man twenty-two years of age with a full case of open-bite, illustrating the typical tongue habit associated with cases of this kind.

At the last meeting of the American Society of Orthodontists Dr. Lewis, of Seattle, showed an appliance which he had used very successfully in treating cases of this kind. An illustration of this particular form of appliance is shown

in Fig. 23. This is based on the principle of its acting as a reminder to the patient, by its presence, of what the correct function should be. I believe that this is the correct mental approach to the problem involved. The patient illustrated, as well as a number of similar cases in my practice, is at present using an appliance of this description, and I am awaiting with great interest the results that I hope may be attained in the treatment of these baffling types of cases.

The most casual consideration of the treatment of a handful of cases, selected at random, reveals the fact that all our scientific information is entirely inadequate to cope with the complexities of the problems involved. We must of necessity supplement this knowledge with some philosophic reasoning of a highly speculative nature and our treatment of cases with artistic feeling of an intuitive nature.

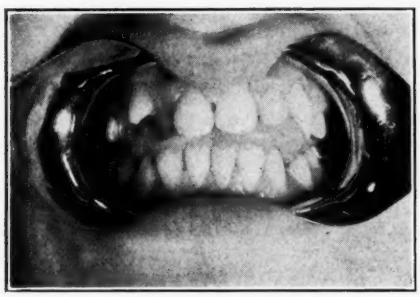


Fig. 22.

Fig. 23.

DISCUSSION

Mr. Cale Matthews, London, said he had had the advantage of seeing Dr. Jackson's work in his office and of spending considerable time with him, and from the generous opportunities of observing his methods of treatment he had come across practically every kind of case that one is ever called upon to treat. He was therefore not going to discuss the paper from the mechanical side in any detail.

He thought the first thing that will impress one from Dr. Jackson's paper and which impressed him from his technic, was his freedom from arbitrary methods of treatment. He was extremely catholic in any ideas which he might apply. He (the speaker) had made a note which bears very largely not only on Dr. Jackson's paper but also on many papers that have been read in other parts of the world, and it is this, What is the etiologic and physiologic principle that causes an Englishman who migrates to the United States with a long narrow face to return to England in a few years with a broad square mandible?

Dr. Jackson had given us perfectly freely his ideas of treatment, and in his treatment he includes the problem of extraction. He thought this problem the most difficult of all, but he also knew that it had a very serious place in the treatment of cases. However, it had to be exercised with such a wonderful care that its difficulty was the greatest they had to contend with. The fact that every particular case had to be considered on its own deformity was one of the essentials that the orthodontist must recognize. That experience was and always would be the most valuable asset in the orthodontic sphere was unquestionable; another asset was the simplicity in his treatment.

XUM

The slides placed on the screen proved conclusively the wisdom of the treatment employed in the degree of force that had been exercised to obtain the results because it was apparent that in none of those cases had the teeth been moved bodily.

The artistic element was one of the most essential points that an orthodontist should consider, and he had preached this doctrine of esthetics as more important than any question of anatomic perfection. The maintenance of the complete denture sometimes gave an appearance of toothiness. He would disregard that appearance in a young child because he always felt that the young child who had undergone orthodontic treatment which was concluded by the maximum age of fourteen years, was in all essentials a healthy young animal; it must be remembered that the mouth was the only part of the skull that came to maturity so early. In children of a younger age one had to consider the possibility of a growth in the upper part of the skull and bear in mind that with the removal of the teeth there was the possibility of a sinus growth in the upper part of the face.

He wanted again to emphasize in this question of the removal of the teeth what he had said many times, the development and the power of occlusal maintenance of the first premolar. In all those cases of denture shown on the screen in which the occlusion was perfect, the development of the first premolar was always in excess of the second; as was shown in one of the pictures, the second premolar on the right side was considerably in excess of the first premolar prior to treatment, but after treatment the whole case had changed and the first premolar was much longer in its eruption than the second premolar.

Some time ago he had some correspondence on the question of open-bite with Dr. Jackson, who told us that he considers the tongue the most potent factor in the correction of this condition. He (the speaker) ventured to suggest that the tongue might exaggerate the condition, but he had never been able to see clinically a case in which the tongue had been held responsible for creating the condition. He had to withdraw this, for he had recently seen a young child who had been under treatment for a bad occlusion of excessive overbite, who was creating an open-bite with the tongue. He presumed that he was being irritated by the difference of the occlusion that has been created, so that his anxieties would be increased by another problem.

The great advantage that he personally had found from the adoption of this principle of mechanical treatment by auxillary springs was that the movements created were absolutely devoid of rigidity. There was no clamping up of the teeth, and hence there was very little complaint from the patient. He should like to warn those who wish to start using this technic that in the hands of Dr. Jackson it looked simple, but there were very many difficulties to be overcome.

Dr. S. William Singer said he wanted to congratulate Dr. Jackson on his paper. He thought his approach was quite correct, but at New York University they attacked the diagnostic problem in a more scientific manner. By the use of the Stanton diagnostic maps they found that it was a highly scientific approach to proper diagnosis especially in teaching postgraduate students. For example, take the unilateral distoclusion type of case; the young man in the practice of orthodontia will certainly find diagnosis of this type of case by the visual method very difficult.

Insofar as the diagnostic mapping process was concerned the subject was too detailed to discuss at this time, and he would have to refer his audience to the writings of Dr. Stanton.

Dr. Jackson, in reply, thanked Mr. Cale Matthews for his very kind remarks in dealing with the subject. There is one thing he had forgotten to mention. This open-bite he considered the most difficult thing to deal with and whatever he had to say in regard to the tongue habit was by no means original. That was suggested to him by Dr. Delabarre of Boston, and he could corroborate it as entirely correct.

He had picked up that little idea of the appliance which he showed for correcting the tongue at a meeting of the American Society of Ortnodontists. He had already used it in about six cases, and he was looking forward to seeing just how well it worked. Dr. Lewis of Seattle had had good results with it.

XUM

A NEW METHOD FOR THE CORRECTION OF STUBBORN TYPES OF MOUTH-BREATHING

Dr. Richard Summa, St. Louis, Mo.

PERVERTED functioning of the mouth musculature and the consequent retarded muscle development are the greatest obstacles for the retention of teeth in their corrected positions.

All cases of perverted functioning of the mouth musculature excepting those attributable to trauma are due to mouth-breathing.

This article submits for consideration a method of muscle training which has hitherto been overlooked. *Tone production on musical wind instruments requires the development and correct use of the musculature which is perverted by mouth-breathing.* In its finality, correct and improved respiration is the object of muscle training employed for the purpose of tone production on a musical wind instrument.

From this fact we must conclude that the development of musical tone production on wind instruments and the retention of certain types of corrected occlusion must be achieved by the same technique.

For a better elucidation of my trend of reasoning, a brief résumé is herewith given as an introduction.

The sequence in which the etiologic factors of mouth-breathing appear is as follows:

Naso-pharyngeal Obstructions Induce Mouth-Breathing.—Mouth-breathing causes perversion of the musculature of the mouth, nose and all other muscles concerned in respiration. Perverted functioning of muscles is most liable to result in arrested development and even in atrophy of these tissues.

Perverted functioning of the mouth musculature and the consequent lack of atmospheric pressure result in malalignment of the teeth in their respective arches and the inevitable malocclusion of the teeth of opposing arches.

Two steps lead up to the contactual relations of teeth of opposing arches, called occlusion. These steps are eruption of the teeth and alignment of the teeth in a dental arch.

Eruption of teeth is a symptom of the scheme of synchronized maturation or ripening of living organisms. If it is correct to include eruption of teeth in the basic vital process of maturation, then a reason has been given for the rarity of inhibited physiologic tooth migration. Teeth *will* erupt because they are endowed with an inherent tendency to migrate in accord with definite periods of maturation. This dictum applies to the largest number of fit organisms. Emphasis is given to the fact that anomalies are not being considered in this treatise.

It can be assumed that an impulse of synchronized maturation is of sufficiently vital importance to supervene over most of the pernicious external environmental influences. The potent tendency for teeth to erupt is evident to every observer of this problem.

XUM

Alignment of teeth in their respective arches is an entirely different and separate issue. Alignment of teeth is dictated and controlled by external environment.

Muscular and concomitant atmospheric pressure dictate and control the alignment of teeth in their arches.

The dental arch is developed within a mold formed by the cheeks and lips on the outer side and the tongue on the inner side. The harmonious functioning of these muscles produces a difference of atmospheric pressure from without and from within the oral cavity. This is commonly called suction. Since normal muscular pressure and atmospheric pressure act at the same time and since either one cannot and does not exist without the other, they are spoken of as being concomitant.

It is essential to stress this fact because the mandible will not remain suspended in repose in the closed mouth when this suction is broken.

Mouth-breathing during infancy destroys muscular and the concomitant atmospheric pressure or suction very speedily and permanently. It is, however, both tedious and difficult to restore the normality of this dental environment. Formerly orthodontists indulged in the fond hope that removal of nasopharyngeal obstructions and the correction of malocclusion would induce normal breathing and normal functioning of the involved musculature. The more stubborn types of mouth-breathing blasted this hope.

Rhinologists, seemingly, have not as yet awakened to the perniciousness and obstinacy of mouth-breathing. In the chapter devoted to mouth-breathing in Jackson's work on *Diseases of the Nose, Throat and Ears,* it is stated that after removal of the nasopharyngeal obstructions the patient usually assumes normal breathing. However, if he fails to do so, the patient is instructed to breathe through the nose. Whenever this also fails a bandage which will hold the chin up in place should be applied. Such superficial recommendations regarding a stubborn perversion are deplorable.

Obstructions which the rhinologist removes rarely recur. Nevertheless, normal breathing following removal of nasopharyngeal obstructions of the severer type is seldom resumed. Patients have not yet awakened to the fact that the rhinologist's responsibilities and efforts should not cease until normal breathing has been reestablished.

The orthodontist is less fortunate. His patients do not relieve him of the responsibility for the pernicious effects of abnormal respiration. Great credit is due to such pioneers as Dr. H. C. Ferris, Dr. Paul Rogers, Dr. Homer B. Robinson, Dr. Kurt Cooper and others who realized and recognized that restoration of correct muscle activities and respiration are essential to the success of the orthodontist's handiwork. Their initiative has aroused the deserved interest in muscle training. Lip and cheek exercises were the first methods to be attempted. By degrees exercises for the correction of other muscle groups were added. It may be presumed that a desire to exercise all groups of muscles in a coordinated manner prevailed.

Nearly thirty years ago orthodontists began to realize that malocclusion of teeth is a link in an extensive pathologic cycle. The antecedent pathologic factors of malocclusion as well as subsequent disturbing influences of malocclusion gradually came to light.

XUM

By the correction of malocclusion the orthodontist breaks into a pathologic cycle. Originally, the orthodontist had endeavored to inhibit only the subsequent lesions. Later he gradually realized that in order to prevent the recurrence of the abnormality he had corrected he must also clear away the preceding devastation.

The term *abnormal respiration* might better express the symptom complex which has been called mouth-breathing. The baneful effect of so-called mouth-breathing reaches far beyond the nose and mouth. The entire respiratory and masticatory apparatus are involved. Retracing the steps into the devastated area which led to malocclusion we find that not only the functioning of one or two groups of muscles must be corrected, but, moreover, the entire respiratory apparatus must be simultaneously corrected. At this point the importance of the tongue should be stressed. During early embryonic life tongue development precedes and exceeds the development of the adjacent muscular structures. Every transverse section of a fetal head shows that the upper surface of the tongue is well rounded and posed between the palatine processes of the maxilla, and that the palatine processes of the maxilla, in order to unite at the median line, grow in accordance with the curvature of the upper surface of the tongue. It is not too audacious to assume that the palatine vault is dictated by the tongue. Likewise the horizontal outline of the tongue dictates the horizontal arch of the maxilla and mandible. The function of the tongue, beginning at birth and enduring for the remainder of life, cannot be overlooked.

Having become convinced that the subconscious and coordinating functioning of the respiratory tract must be restored, the next step was to seek a method for accomplishing this. The requisites then were to find a method which strives to attain a desirable goal or objective. Furthermore, the organic and functional development necessary to attain this goal should be obtained subconsciously because respiration is a subconscious function. Development and functioning of all structures involved must be harmonious and balanced.

It is also highly desirable that the goal can be used to check up the correctness of the exercises.

The playing of musical wind instruments embodies all these requisites. Correct production of tone on a musical wind instrument is a positive proof that respiratory function has been properly exercised.

In all probability musical wind instrument playing will insure retention of corrected occlusion which otherwise would be prevented by a stubborn persistence of abnormal respiration. The time required for orthodontic retention will undoubtedly be shortened. Some types of malocclusion can be inhibited.

It was my good fortune to meet a musical wind instrumentalist who had given much study to the matter of respiratory development as it concerned the art of tone production on his chosen instrument. It seems that performers and teachers of musical wind instruments have been groping in the dark for a scientific explanation and diagnosis regarding the impediments presented by many prospective students of these instruments. Since I belong to the class of orthodontists who are seeking a method for respiratory development, this trumpeter and I found much solace in our communion. The musician referred to is Mr. Joseph Gustat, first trumpeter of the St. Louis Symphony Orchestra. His story follows.

XUM

MUSCLE TRAINING AND DEVELOPMENT OF RESPIRATION AS TAUGHT BY MUSICAL WIND INSTRUMENTALISTS

JOSEPH GUSTAT, ST. LOUIS, MO.
First Trumpeter of the St. Louis Symphony Orchestra

PERFORMERS on musical wind instruments must develop correct breathing. Correct breathing involves the muscles of the mouth (lips, cheeks and tongue), the muscles which control the movements and placement of the mandible, and the intricate muscle complex of the nasopharyngeal tract, the chest and the diaphragm. As a performer and teacher of the musical wind instrument called trumpet, I have realized the fact that malocclusion of the teeth accompanies severe types of incorrect and insufficient breathing. I have also observed that maloccluding teeth interfere with and prevent proper adjustment of the lips and tongue to the mouthpiece of musical wind instruments. The adjustment of the lips and tongue for wind instrument playing is called *embouchure.*

I am now convinced that orthodontists can sympathize with musical wind instrumentalists in regard to the difficulties which both encounter in their efforts to develop correct functioning of all the structures involved in the respiratory tract. Trumpeters will certainly welcome the cooperation of orthodontists with much enthusiasm. The cooperation of orthodontists and musical wind instrumentalists is a new endeavor and a joy. Through the mediation of Dr. Summa I welcome this opportunity to discuss points of mutual interest with practitioners of any of the branches of medicine to whom this matter may be of interest. A sympathetic hearing of this problem has already been given by the St. Louis Society of Orthodontists. I might state at this point that this matter will be published in one or more musical journals.

Since neither I nor any other trumpeter had foreseen the possibilities of this mutual cooperation, no definite records of what has been achieved by musical wind instrument instruction in cases of improper breathing and the concomitant perverted muscle activities have been kept. No doubt every performer and teacher of wind instruments can recall many experiences which will corroborate our observations. From now on, with the cooperation of St. Louis orthodontists, a systematized study of this matter will be made, and we shall report the results of our experiments truthfully in due time. In the meantime we urge orthodontists in various parts of the country to establish similar cooperative plans with wind instrument teachers.

Not infrequently individuals who have protruding maxillary teeth and receding mandibles apply for the study of musical wind instruments. Many of these individuals have short upper lips, and I recall one young man who had an everted upper lip, exposing much of the mucosa.

From experience we know that individuals with protruding maxillary teeth and receding mandibles are lacking in muscular force to control the movements of the mandible. These young people cannot hold the mandible in the forward po-

XUM

sition necessary to produce the proper adjustment of the lips and tongue to the mouthpiece of a wind instrument. We have also learned that in these cases the individual has more difficulty in breathing than one who has teeth occluding normally.

Of course, musicians were not aware of the fact that the above described conditions can be systematically diagnosed as malocclusions. Because of this lack of knowledge, whenever prospective students applied for instruction we conjured a certain intuition to determine which wind instruments were best adaptable to any given case. I believe that the knowledge we are about to obtain from orthodontists will enable us to base our recommendations on scientific grounds. In appreciation of these instructions we gladly contribute our experiences in muscle and breathing exercises for the possible benefit of the various branches of medi-

Fig. 1 illustrates a trumpet mouthpiece. This is typical of all mouthpieces used on brass wind instruments. To this class belong the bugle which is the most primitive type, the cornet, the trombone, the French horn, the euphonium, the alto and the tuba. These mouthpieces are made in numerous sizes and shapes.

Certain types of lip deformities may be corrected by the use of wood wind instruments. To this class belong the flute, the clarinet, the oboe, the bassoon and the saxophone.

The method of respiratory development is the same for all of these.

cine. Since I have become somewhat familiar with the underlying causes and effects of oral deformities and mouth-breathing, I am surprised that we succeeded to the extent of improving the outward signs of oral defects. I have great hopes of attaining much better results in the future from cooperation with orthodontists and rhinologists.

For a more ready understanding of muscle exercises prescribed in the course of wind instrument instruction, a brief description of the mouthpiece of a trumpet might be of interest.

Tones are produced on musical wind instruments by an attack made by pronouncing the letter "T."

The tone is then sustained by a gradual and constant expulsion of the air through the aperture formed by proper adjustment of the lips to the mouthpiece, "embouchure." In order to store and conserve the air used for sustaining the tone, lung expansion and diaphragmatic breathing must be developed.

XUM

The volume and pressure of the air expelled are controlled by the size of lip aperture and by diaphragmatic pressure. Thereby the lung capacity is increased.

To develop speed we employ what is called single-, double- and triple-tonguing, and incidentally this develops and strengthens the tongue. For single tonguing the attack is made by pronouncing the letter "T," for double tonguing the letters "TK" and for triple tonguing "TTK." Another important exercise of the tongue is employed when tones are slurred. To produce slurring of tones the necessary intervals are produced by "ta-ee-a-ee." To strengthen and develop mandibular muscles we recommend an exercise of forcing the body away from a door jamb by moving the mandible forward and backward.

We also recommend to young people that they hold the mandible in a forward position while going to and from school and during hours of silent study. For strengthening and lengthening the upper lip we recommend placing the mouthpiece high, almost in contact with the nasal septum, then adding pressure and sliding the mouthpiece downward to the proper position for playing. The mouthpiece is held in this position until the lip tires. After resting the lip this exercise is repeated as often as possible. The stronger the lip becomes the oftener this exercise can be repeated. To strengthen the muscles of the cheeks and lips simultaneously we give exercises for the production of tones in the lower registers and in the higher registers. The lower registers require a relative relaxation of the muscles while the higher registers require contraction of these muscles. These technical facts are brought out to emphasize the idea that wind instrument playing employs all these functions simultaneously, coordinately balanced and subconsciously. Last and not least the production of true tone is a positive evidence that the requisite functions have been correctly exercised.

This is seemingly in accord with the postulates laid down by Dr. Summa in his search for a method to correct stubborn types of mouth-breathing.

Dr. Summa and I are fully aware of the chief objections which will be offered to the plan of augmenting orthodontic and rhinologic treatment with a study of some suitable wind instrument.

A free and fearless expression of objections and questions which will arise as a result of this suggested innovation is not only welcome but urged.

We hope that these articles may suggest additional ideas for the muscle training methods now in vogue. I shall be very much pleased if any one feature brought out will prove beneficial. Some reader may be sufficiently ingenious to invent an apparatus to accomplish the desired results without resorting to musical wind instrument instruction.

For my part, I hope that the teachers of musical wind instruments can convince prospective scholars who are hampered by respiratory defects to undergo the necessary orthodontic and rhinologic treatment in order to make them better and more enduring performers.

XUM

ORTHODONTIA ASSISTANCE*

CLARA DE LONY BRADFORD, BIRMINGHAM, ALA.

ORTHODONTIA assistance covers an entirely different field from that of assisting in other dental lines. Perhaps the most outstanding difference lies in the fact that this specialty deals almost exclusively with children. Unlike the average dental patient who visits the office a few times and is perhaps seen no more, these little folks come regularly for years and virtually grow up, as it were, under our care, absorbing in their impressionable years the influences received from association with the orthodontist and his assistant—which influences may be either good or bad. So the orthodontist's assistant should be not only a helper in correcting facial deformities, but also a builder and molder of good moral character. No other line of dental assisting offers this opportunity for so great a service.

The handling of children is by no means a subject to be scoffed at. Many books have been written on this subject, and we rarely open a magazine without finding an article dealing with child life and management. It is interesting to note and compare the varied theories expounded by these numerous writers. In assisting in the various other dental lines, the assistant should be seen and not heard, but in dealing with children this rule is not adhered to. Since these children visit the office over such a long period of time one is enabled to differentiate between the likes and dislikes of the various ones; and, if the assistant and orthodontist fail to make the most of this opportunity, they have failed in one of the most important aspects of child management. The time was when the hard-boiled school teacher governed the school with a rod and rule; that day has passed. The twentieth century young American can no longer be driven. Discipline has lost none of its power, but it must be administered with kindness rather than with force. The great Boy Scout movement has long since discovered this great secret, and the boy finds himself putting forth his greatest effort to achieve, not because a punishment awaits him if he fails, but because a reward is his if he succeeds.

Among the children who come to the office are baseball and football enthusiasts, pugilists, calf club boys, cotton club boys, boy scouts, paper doll lovers, marble artists, young Lindberghs, and radio artists, and scattered through the throng maybe a few lovers. You say the dental assistant ought not to know about all these hobbies, talents, and eccentricities? I believe that the sooner they are learned, the sooner the handling of child life will be mastered. If this group of children which throngs the offices year in and year out are to be handled, treatments administered, and then the children made to welcome the day of the next appointment with the orthodontist, some influence greater than that of rule-of-thumb must be brought to bear.

*Read before the seventh annual meeting of the American Dental Assistants' Association.

XUM

I very rarely attend a baseball game, but I do know the name of the local team. So when Ernest, a baseball fan, comes in which would sound better, "Ernest, hop up in this chair, we have a houseful waiting," or "Ernest, what did you think of the way the Barons played yesterday?" To be sure, the patient will in a moment display more information as to the activities of the Barons than the assistant can learn in a week, but if her wits are quick, she will ask leading questions and avoid answering those directed at her whose answers she does not know. It would be better if she were thoroughly familiar with all the clubs' activities, but it would be impossible to familiarize herself with all the hobbies of all the patients. Thus in fraternizing with the little fellow, he gets the impression that the assistant in the orthodontist's office is unlike other white robed nurses, but rather is a human being who still believes in the things that are near and dear to the heart of a boy. If a patient happens to be one of those appliance destroyers whose one great aim in life, it would appear, is to see how quickly he can get out of his mouth all that has been so carefully placed in it, the assistant should come at him with moral suasion. If he is too young to be a member, she should say, "Robert, are you going to join the Boy Scouts when you get old enough?" The reply will be in the affirmative. "Did you not know that a good Boy Scout will not destroy property and other useful things? Well, you have torn this appliance out of your mouth and ruined it. It will cost us lots of trouble to make it over. I do not believe the Boy Scouts will take you in if they find out how destructive you are."

Among other great life lessons certainly should be mentioned punctuality, attention to duty, truthfulness, reliability, etc. The assistant should place the responsibility of keeping appointments, and of keeping them on time, on the shoulders of the patient. Why not let him learn the value of such things now? If the obstreperous patient already mentioned willfully breaks an appliance and comes in and like a man acknowledges the guilt, for a time at least he should be praised for his truthfulness and not abused for his willfulness. It may be possible thus to build up that latent manliness in him rather than to develop pugnacity.

I maintain that these are great life lessons which should be instilled in the individual for more reasons than one. First, it is our duty, and second, it develops a better individual with whom to deal. Since the orthodontist's practice is confined largely to children, and since they must of necessity be handled between school and nightfall on short winter days, it behooves the assistant to be alert. She should have sufficient rest at night and wholesome meals in order that she may keep in the pink of condition physically. Otherwise, these two phases of our program cannot be successfully carried out. The orthodontist, fortunately, does not use a large number of instruments. Whether he does or not, a first rank assistant can and should anticipate his wants, and, if possible, should keep him from having ever to do more than reach his hand out for the instrument to be placed in it. I feel that I have most nearly done my duty when I assist the doctor in handling a given case and succeed in passing only those instruments and no more than he needs without his having to raise his eyes from the field of operation.

XUM

It is one of the main duties of the assistant to make up the program of the day. Appointments should be made in a suitable book. If the doctor is one who likes to see the personnel of the day, a sheet should be copied from the appointment book and laid on the bracket table. Over the laboratory bench, a card should be hung carrying a list of all appliances to be made that week, and the day needed. From this, the laboratory technician can see at a glance what his duties are from day to day. A pad and pencil should be handy at all times for the purpose of listing supplies as they give out, for it is a crime in this profession for the doctor to call for a piece of band material and the assistant to announce, "I forgot to order it."

When the doctor is absent from the office, the next ranking officer, if you please, is the assistant. The doctor may be playing golf too much, but she should keep this excessive indulgence away from the public. She should at least know how to give physical and mental comfort to the patient with a broken appliance. It is quite important that she handle with tact that patient who comes for the first time when the doctor is out. To announce in cold words that the doctor is out of the office for the day is far from the performance of full duty. On the other hand, to get the patient over to the model cabinet, show him a cast of a case similar to the one under consideration, with the announcement, "We have been able to get some beautiful results in classes of cases like this, and I know Dr. Blank would be eager to see this mouth," would convince the newcomer that he was in an office where even the assistant was vitally interested in every phase of the work performed therein, and nine times out of ten he would ask for an appointment.

The presence of an assistant in the orthodontist's office should dignify it. Little boys and girls come unattended, and the presence of a womanly woman is their safeguard. More than that, she should be present for medicolegal reasons. Her ear should be open to all conversations regarding fees, promises, and other agreements entered into between the orthodontist and his clients. Her voice will settle many a dispute, and her testimony on the witness stand will win many a case.

In conclusion, let it be said that the purpose of this paper is not to catalogue all the duties of an assistant in the orthodontist's office, but rather to convey some principles which should be observed while acting in the capacity of assistant. Those mentioned are by no means all but will illustrate what I am trying to get over. To these may be added others, so that if we can bring ourselves to the point of striving with all our might to fill in a large way our professional sphere in life, it can be said of each of us, as individuals, that "She hath wrought well."

XUM

DEPARTMENT OF
CHILDREN'S DENTISTRY

DENTAL CONDITIONS IN CHILDREN: ITS IMPORTANCE TO THE PEDIATRIST*

C. B. Bray, D.D.S., Birmingham, Ala.

AS THE title of this paper indicates, it will deal with dental conditions found in children, which I believe will be of interest to you as pediatrists. We all know that in the past the dentistry of children has not been given the amount of serious consideration that it deserved. However, in recent years there has been an awakening to its importance, and it is now becoming one of the major specialties of dentistry. This has been brought about largely by the discovery of the effects of focal infection from the teeth and mouth on the body generally, and the realization that dental infection in childhood can be as common and as serious as in adult life, in its systemic as well as in its local manifestations.

In a general discussion of this subject it is well to remember that the teeth begin to form very early in embryonic life. For this reason, it is necessary in the prenatal care to begin the foundation for building good teeth. Diet of course is the earliest method of treatment and about all that can be done at this stage. However, it is important, and upon the obstetrician must fall the responsibility of giving proper advice as to diet.

The eruption of the teeth is the next step, and in the majority of children the lower central incisors begin to erupt at about the age of six months. In some cases they erupt by the fourth month, and in others not until the eleventh to fourteenth month. The early or late eruption of the teeth in children otherwise normal does not imply any abnormality at all. It is merely an individual difference and is without bearing on the quality of the teeth or the general health.

From the beginning of tooth eruption until its completion, which usually occurs at the age of three years, little attention is usually paid to the teeth, either by the dentist or the physician, except perhaps to advise the mother regarding thumb-sucking and lip-sucking, habits which will cause deformities if persisted in. However, from the age of three, preferably, and certainly from the age of four, the child should receive very careful dental attention. He should make frequent visits to the dentist, at least every three months, for an examination and prophylactic treatment. By so doing many painful and serious conditions can be prevented.

*This paper read in Section on Pediatrics, Southern Medical Association, 25th annual meeting, New Orleans, La., November 18-20, 1931. This paper is published by courtesy of Dr. Bray and the Southern Medical Journal, Volume XXV, July, 1932, Number 7.

XUM

We must bear in mind that the deciduous teeth fill a very definite purpose and if possible, they should be retained and be kept in a healthy condition until they are replaced by the permanent ones. In addition to immediate trouble, the future condition of the child's mouth depends, to a large extent, upon the care given these teeth. It is well to recall that the deciduous teeth have just as long roots as the permanent ones, and if they are kept in a healthy state and free from cavities, the roots will gradually be absorbed as the permanent teeth are ready to erupt to replace them. However, if they become diseased and devitalized, normal physiologic absorption of the root does not occur and any absorption that occurs is pathologic and due to infection. During the period of root absorption the deciduous teeth are not very resistant to decay, and the permanent teeth, still, to an extent, in a formative state, are not as strong and resistant to caries and infection as when their development is complete. Such being the case, it is reasonable to believe that more care should be given the mouth and teeth at this period of life than at any other. However, in perhaps the majority of cases the reverse is true, and no serious thought is directed to the teeth by the dentist, or the physician, until the child complains of toothache. Then the dentist will find, instead of a reasonably normal and healthy mouth, a mouth containing broken down and badly decayed teeth with large cavities full of unmasticated food, and often dead and abscessed teeth with fistulas extending along the gum margins, or so-called gum-boils, with free pus draining continually into the mouth, some to be swallowed and some taken up by the blood stream. Can we expect to find a normal, healthy child under such conditions? The child cannot eat and will not try to do so because it hurts to chew; if food is taken, it is not masticated, and is carried into the stomach in a poorly digestible form. From blood stream absorption from the infected foci around such teeth, we often find heart disease, pyelitis, rheumatism, chorea, and many other systemic diseases. Also with such an oral condition, even if he escapes serious disease, the child often becomes badly handicapped in school, often does not pass his grades, becomes listless at play, and generally unhappy.

I wish to impress upon you the fact that such conditions can be prevented, and should be prevented by early and frequent dental care, and I wish to urge upon you, as pediatrists, the responsibility of advising such a course. However, if for any reason early dental care has not been obtained and the child has not been seen by a dentist until some of the conditions mentioned above have already become established, there is still much that can be done. The dead and abscessed teeth should be removed, the decayed ones should be cleaned and filled, and kept cleaned and properly filled until normally replaced by permanent teeth.

Some believe that extraction of the deciduous teeth will cause irregularities of the permanent teeth. It sometimes does, but I believe that most of us would prefer to produce a slight irregularity of the teeth, something that can be corrected by mechanical means, rather than risk the production of a serious and permanent heart or kidney condition by leaving in the mouth an obvious and certain focus of infection. Too often such a condition exists and the child is never seen by the dentist. The parents are possessed with the idea that

XUM

nature will make all repairs and adjustments and that the deciduous teeth will be lost in a short time anyway, so why bother to care for them.

You have an excellent opportunity, in the course of your general physical examinations, to observe the condition of the mouth and teeth and to overcome this attitude on the part of many parents by appropriate advice and education; and too, from your own standpoint in diagnosing disease, you will be neglecting the contributing cause of many ailments if you fail to take into consideration the oral condition of your patients. This is a very important step in the general physical examination of every child and the examination of the teeth should be painstaking and thorough, and where there is any doubt, x-ray examination should be made as well. In this regard, it is well to state that an x-ray examination alone is not sufficient, and taken by itself may be misleading. When x-ray studies are made, a careful physical examination of the teeth and gums should be made and the findings of both examinations considered in reaching a diagnosis.

Another subject to which I wish to refer briefly is Orthodontia. It is extremely important to recognize at an early age the existence of dental irregularities that will require mechanical correction. It is very important that such conditions be corrected, not only from the esthetic standpoint but also because malocclusion is one of the most frequent causes of caries and pyorrhea. Teeth occluding improperly are subject to a continual trauma and soon the effects will become apparent in the teeth themselves and in the peridental tissues.

Children should be most carefully handled. Truthfulness by all means should be followed throughout. It is very unwise to be untruthful to your little patients or to misrepresent to them in any way anything you are doing or are going to do for them. Many appointments may be spent to good advantage by not doing anything for the child except to gain its confidence, and I feel that this is just as important to you as medical men as it is in dentistry.

In conclusion, I wish to express my appreciation of the privilege of meeting with your Society, and I again wish to urge upon you the importance of dental conditions in children. The prophylaxis and treatment of the conditions of the teeth themselves are of course largely problems for the dentist. However, the proper supervision of the general health and the advice to parents which causes the child to be brought to the dentist are subjects in the sphere of the pediatrist, and it is from this standpoint especially that I ask your cooperation.

DISCUSSION

Dr. L. T. Royster.—Most of us neglect the teeth and mouths of our patients, and still more of us do not know the language of dentistry. I think child dentistry should be a specialty.

There are three causes of failure of eruption of teeth; familial tendencies, malnutrition, and feeble-mindedness. Many times we can tell which is the cause, but frequently we cannot. The next question is whether food or hygiene is more important in preventing decay of the teeth. Those of you who heard Dr. Mellanby a year ago may feel he is somewhat of a dreamer and an idealist. But he showed us irrefutable evidence that the state of nutrition does influence teeth after the permanent ones are erupted.

XUM

The pediatrician should have this idea, that a temporary tooth is either good enough to be saved or bad enough to be taken out. The dentist today who thinks in terms of pediatrics feels that way about it. Of course, some defects of occlusion may result, but they can be corrected. This is, of course, a great economic problem, and there will be a time, perhaps, when orthodontia will be less expensive than it is today. Also, there is a question as to how far tooth infections are responsible for some of the conditions Dr. Bray mentioned. That they do cause trouble there can be no doubt. Orthodontia, which I consider one of the most important things in child life, is seldom stressed by the pediatrician and almost never by the general practitioner. I hope the day will come when we shall know how to prevent malocclusion of the teeth rather than how to correct it. We know that faulty habits of chewing and faulty habits of swallowing cause malocclusion. We should take these children to a man versed in orthodontia.

Dr. D. Lesesne Smith.—We who deal with children should not forget that the teeth can cause as many symptoms as tonsils. The teeth are as frequently guilty of a train of secondary symptoms, for instance, pyelitis, and the other diseases that go with the absorption of poisons. Unfortunately, dentists are seldom as willing to pull or extract diseased teeth as the throat men are to take out tonsils. I find it extremely hard sometimes to convince the dentist that it is the thing to extract those teeth. Frequently the children come from the dentist to me for some trouble and I have to send them back either to the same dentist or to another for the extraction of diseased teeth.

Dr. A. A. Walker.—Many years ago the late Dr. J. Ross Snyder read a paper before the Section on Diseases of Children of the American Medical Association on the importance of attention to the temporary teeth when considering diseased conditions in children. He was one of the first in this country to insist that teeth as well as tonsils should receive consideration in the practice of pediatrics. It is largely due to such papers as the one referred to that we have Dr. Bray on our program today.

I have always felt that the age at which dentition occurs is an individual characteristic and seldom bears any relationship to rickets. The experience of the essayist apparently agrees with this opinion.

Dr. Roy E. de la Houssaye.—We think too little about the eruption of teeth and their care in pediatric practice today. Old practitioners and the majority of lay people attribute many ailments to teething. I am convinced that during dentition the greater number of babies seen by me have a lowered resistance to infection.

I have used cod liver oil and viosterol in large amounts, but still these have not seemed to be a panacea.

I have found that fruit juices given early in life and in large quantities have greatly increased the resistance of these children, and we do not find as frequently the attacks of diarrhea that we used to see four or five days prior to the eruption of a tooth.

In the children who are referred to the dentist by me for the care of their first teeth, many of the cavities which are filled abscess. I should very much like an explanation of this occurrence.

Dr. Bray (closing).—The formation of abscesses in deciduous teeth that have been filled occurs largely in deciduous teeth that have reached the stage of aching before they are treated. It is practically impossible to fill a deciduous tooth and keep it from abscessing after it reaches that stage. We must see these children early and fill cavities before they become large enough to involve the pulp. Deciduous teeth decay even more rapidly than permanent teeth.

XUM

A VIEWPOINT OF A DENTAL ASSISTANT AND THE MANAGEMENT OF CHILDREN IN A DENTAL PRACTICE*

ANNE RAGSDALE, ATLANTA, GA.

I REALIZE that some of the things I am going to say will not be particularly applicable to those of you who are employed as dental assistants in a general practice. It will be necessary for me to be rather personal in presenting to you some of the ideas which I have found workable in handling children in a dental office.

One of the first things which is of importance is that the child be greeted promptly and properly when he comes into the reception room. Especially is this true on the first visit. Most children are full of imagination. No doubt he has heard at home or at school many stories about how badly the dentist has hurt someone. Maybe he has overheard his parents speaking about what a hard time they had in Doctor So and So's office. The parents may be speaking in jest, but the child does not realize this and often times magnifies what he has heard. The child remembers all that he has heard as he enters the reception room, waiting to greet the dentist whom he does not know and naturally he has visions of someone who is going to hurt him badly and someone who is cruel and mean. The longer he waits the more real his imagination becomes. Therefore, a prompt reception of the child often times puts his mind at ease before he has had time to build up in his mind the idea that something terrible is going to happen to him.

Every reception room should have a little corner devoted to children. In this corner there should be a couple of small chairs, perhaps a small table and on this table some magazines or books which are of interest to children. A few toys sometimes are valuable for the smaller child.

A white uniform, because of its severity, sometimes frightens a child. For this reason, it is not good procedure for an assistant to approach a child too hurriedly. Instead, go up to the child and stoop naturally, so that your eyes are on a level with those of the child. Then question him and talk along the lines of conversation that interest him. The child will then come closer. This seems to help the child establish confidence in you.

I find that if you speak to the child first before speaking to his mother, or attendant, that you impress him with the idea that he is the center of attraction. Also, when you are filling out a record card for a new patient, direct as many questions to him as possible, such as age, name, what street he lives on, etc. If he is an old patient always greet him with his name. It seems to make them feel more at home and among friends. "Children have vanity like adults, and many resent in their own way salutations such as 'Hello Sonny,' or 'Hello Dearie'."[1]

*This paper given before the Georgia State Dental Assistants Association, Atlanta, Georgia, June 9, 1932.

It is true that after a hard busy morning standing over the chair assisting, it is most difficult to be pleasant and happy to a child. But nevertheless, it is most essential that the assistant greet the child in a happy mood. She should be at all times pleasant whether the child is on the first or second visit. If it is the child's second visit, it is well to remember some of the pleasant things that happened on the first visit. Any casual remark such as, "Well, we are mighty glad to see you back, I just know you came back to get another pretty filling. I bet you were proud of the one we put in last time. Did you show it to Daddy?" Or the assistant might comment favorably on a new dress or a new hat or anything that will immediately get the child's mind on something besides what he came for.

The proper frame of mind is essential of both the dentist and the child. If the child is not in the proper frame of mind then immediately he begins a resistance which is carried from the reception to the operating room and becomes quite often a serious problem in the hands of the dentist.

Patience is the first rule for the proper handling of children. A casual remark made to the dentist will often times put the dentist in the proper frame of mind before the child comes into the operating room. It is so easy to say to the doctor, "Our little patient, so and so, is here, and looks so nice today, I think we can accomplish a lot if we will be patient." Or the assistant might say, "We have a new patient, a small child, who is very attractive, she seems afraid, I know we will have to be very patient with her." These remarks may put the dentist on guard, particularly so, if he is inclined not to be patient with children.

The successful assistant should realize that this is a new experience for the child. And that patience and perseverance are essential, and that eventually it will make or mar success. We must also realize that it is not so much the present as it is the future to which one must look.

It would be impossible to try to deal with all phases of handling children. For their personalities and types vary just as they do in adults.[2] One child will act like an adult and require little introduction into the office. The next may be a little strange and require slight introduction. The next may be decidedly shy and require more care. While another may be self-willed and spoiled and require a certain amount of sternness with his treatment. The child should never be fooled by saying, "It won't hurt." The word "hurt" should never be used except where it is absolutely necessary. If there is a possibility of hurting the child, then the assistant or dentist should say, "This may hurt you a little, but if you will be still so we can work quickly, it may be possible to do this without hurting you at all." The child should never be forced to the point where he is tired and restless by long appointments. (I have found in our office that long appointments spoil many good patients.) If it is necessary to work over a long period of time, allow the child to get down out of the chair and relax and stretch, when he begins to show signs of being tired. Also, some simple types of reward, such as a cotton roll, sandpaper disks, or a booklet, will prove beneficial to a child between the age of four and eight.

The assistant should be on the alert to find out something personal about the child, who his playmates are, if he has any pets, or what school he goes to.

XUM

his teacher's name, or anything that will give a common ground on which the assistant and the child can meet in conversation.

The attitude of the assistant should always be one of sympathy. The assistant who is not sympathetic will not only make her work harder, but will make it more difficult for the doctor and most difficult for the child and his parents, and at the same time build up in the mind of the child an attitude of fear which he may never overcome.

I do not mean that it is not necessary to be firm with a child. Quite often it is essential in handling children, but firmness with a smile works miracles, while firmness with a frown on your face drives away the child and often times drives away a family of good patients.

If you find it hard to be patient with a child, put yourself in the child's place.

REFERENCES

1. McBride: Juvenile Dentistry, Lea & Febiger, Philadelphia, 1932, p. 24.
2. Suter: Dentistry as a Profession and Business, Ritter Dental Mfg. Co., 1930, p. 340.

701 Doctors Building.

DENTAL HEALTH EDUCATION IN PUBLIC SCHOOLS*

C. Carroll Smith,† D.D.S., Peoria, Ill.

IN THE midst of the progressive forces of the times, a boon to mankind steps into the limelight and offers its benefits for the good of the race. It comes as a solution for many a human problem that has never yet been solved. This gift of beneficence stands ready to serve in answer to a question that is being asked in every community, "Shall Dental Health Have a Place in the Curriculum of the Public School System?"

Here inspiration and a call to service combine to offer a possibility for increased activity in behalf of the health, culture, usefulness and happiness of the girls and boys in training in our public schools. "Why Dental Health in Public Schools?" Because of its need in the life of the child. Because of its place and province as an educational factor. Because of its function as to dental inspection, dental service, and the opportunity it presents as an aid to pedagogics. Because of the practical benefits to be received for the physical, mental, and cultural welfare of the child.

The idea of Dental Health is with us as a factor of mental, physical, and disciplinary illumination for the good of the growing girls and boys in our midst. Where shall the workshop be located to develop it? In the same educational factory that is molding the mental processes of childhood.

The dental profession is in possession of knowledge that the school age needs as a part of physical and mental preparation for life. How are the dental profession and the educational profession to combine in a comprehensive program that will serve the child through an educational process and measure up to modern methods in pedagogics? Dental Health must be recognized as an essential to a well-rounded preparation for usefulness and as a refining characteristic in the process of perfecting the whole man. In order that this important subject may become a part of the child's common school education, it must be made to conform to and correlate with other curricular activities.

Community dental education is not a luxury but a necessity—a prerequisite to good scholarship and good citizenship. Every community has a right to this service. It is a joint responsibility of the dental profession and of the community. The community and the dental profession should cooperate.

The school needs the dentist and the dentist needs the school, but the dentist is not trained normally in teaching processes and the public school teacher is not trained dentally. Then it must be someone's particular problem in a community to administer the office of dental health, to study the need of that community with special reference to the teaching advantages offered through the local educational system. Teachers for teaching and dentists for dental health information should make an ideal combination.

*This is a Radio Broadcast, given under auspices of the Peoria Public Schools and the Oral Hygiene Committee of the Peoria District Dental Society.

†Supervisor of Dental Department, Peoria Public Schools.

XUM

When the dental program was inaugurated in the Peoria, Illinois, community in 1909, it was not very welcome. There were few who knew enough about the benefits in store to realize its importance. Through patient and persistent endeavor, the movement gained in favor and it was not long before there was quite a nucleus formed among dentists, instructors, and citizens who saw the light of promise. The work grew. For a number of years, there was much groping in the dark. The story of struggle and courage amid discouragement and opposition is a matter of history.

Through the process of developing this dental health program, the administrative forces in our schools have been magnanimous. Superintendent, supervisors, principals, and teachers have given their efficient and constructive cooperation. The board of education has stood by with a wealth of good cheer and a degree of confidence that has upheld the morale of the department.

It has been my privilege to serve for fifteen years as supervisor in the Dental Department of the Peoria Public Schools. During this time, the confidence and support of the Peoria District Dental Society has helped to tide over many a difficult situation. This society's committee on oral hygiene has efficiently and unselfishly acted in an advisory capacity, always standing by in time of need as protection and encouragement, but it is the superintendent of schools, the supervisors, the principals, and the teachers who have been our mainstay and support. It is through their counsel and constructive criticism that we have arrived at our present state of progress. Too much cannot be said in appreciation of the comradeship of our teaching force.

Two projects in dental health are given each year to each grade. They are of such a nature as to allow the teacher ample time for production without interference with regular studies. The pupils are always eager for these projects. They afford pleasant occupation, carry definite instruction which tends to habit formation and act as a spur to endeavor.

"Why Dental Health in Public Schools?" The answer is to be found in the child's increased capacity to express health, happiness, and usefulness through mental and physical improvement.

The aim of those connected with the Clean Mouth Movement in the public schools of Peoria, Illinois, has always been to progress away from reparative and remedial measures into preventive features in dental health for children.

We believe that the work of the school dentist should be educational and prophylactic. Prevention, rather than repair, is the keynote to the situation. It is our belief that the public school system can never be responsible for a reparative practice of dentistry among children because of the expense involved in equipment and number of dentists necessary to carry on the work and because of paternalism or federated dentistry.

Only the simplest service can be rendered to the pupil, stress being laid on preventive measures to conserve the sixth-year molars through protecting their pits and fissures, to keep such deciduous teeth as can be preserved in a useful condition and to remove such as are abscessed and beyond usefulness. Restorative operations are referred to the family dentist.

The main duty of the dentist in the schools should be to instill clean mouth habits, to develop an appreciation of the proper care of the teeth, teach the

XUM

right use of the tooth brush and keep the pupil comfortable so that he can appropriate the principles of an education.

A few general results from the Dental Department of Peoria Public Schools include:

A. Clean mouth habits established.
B. Comfortable pupils and better scholarship.
C. Fifty per cent of pupils under care of dentists, many benefiting from the correction of malocclusion.
D. Increased mental efficiency through cleaner, healthier, and happier girls and boys, saving taxpayers' money in fewer children repeating their grades.
E. An awakened appreciation of dental service in the entire community.

Benefits received through the activities of the dental department are measurable in educational values and are of such a character as to be reckoned in terms above money. We must recognize that those pupils, by the improvement in their health and scholarship, are less expense to their parents, as well as of greater value to the community, because of their increased mental ability.

Our dental department contacts with the pupil to eliminate fear, to prove to him that a dentist is his real friend and to keep him comfortable so that he can think clearly and act freely, urging upon him the correct care of the deciduous as well as the permanent teeth.

Less than a month ago a third-grade boy came to us for the removal of two abscessed deciduous teeth. He had suffered so long and so severely that he was dull and not interested in much of anything. He was a good soldier in the dental chair and before leaving the dispensary had assumed an entirely different outlook on life. He thanked us very courteously for the service rendered and expressed a cheerful attitude and an expectancy for better scholarship.

During the month of October, a grandmother came to us with three orphaned girls in second, third, and fourth grades respectively, who had been suffering for more than a year with many abscessed deciduous teeth. The effect on their dispositions, as well as on their scholarship, to say nothing of the poor health involved, was a sore trial to the grandparent who was mothering them. We removed the offending teeth, made friends of the children, gave them new impetus for their school work, and brought sunshine into the home and school room through an improved condition of health, comfort, and happiness.

We could recite many instances from our dispensary service of pupils exhibiting poor scholarship and lack of poise, who came to us with extreme dental defects. After the defects were corrected and the mouths put in healthy condition, the pupils' entire attitude toward their work changed and they made their grades without trouble.

The educational projects conducted by the dental department in the Peoria schools correlate with other subjects in the curricular activities. These projects furnish pleasant and profitable seat work and supplementary material which

XUM

teachers and pupils find useful and instructive. This method furnishes valuable opportunity for the pupil to discover his talent and much attractive material is provided for exhibit purposes.

In this educational program, proper food values are stressed. This accords with modern dental research which proves that dental health is an important factor in connection with right food habits, personal hygiene and good scholarship. It is good to keep the teeth in repair; but to avoid dental decay, it is necessary to eat wisely.

Pupils in the Peoria Public School are taught that to lay a foundation for dental health they must begin with the food they eat; that teeth must be fed to make them grow, just as the rest of the body needs food to make it grow; that with right building material given it, the human body can build teeth so strong and perfect that decay cannot touch them.

In order that the body tissues may be in the best possible condition and the teeth better able to resist decay, the girl and boy must have a well-balanced diet.

The growing child has a definite calcium requirement. If the teeth and other body tissues are to be maintained in a normal state of health, this calcium requirement must be provided for through the daily use of foods rich in calcium. A diet of milk and orange juice is a complete food ration sufficient to meet the calcium requirement of an infant. As the babe grows older, vegetables, fruits, cereals, eggs, and meat in moderation are added to the diet.

Milk is the strongest factor in the diet of the school age child.

By means of carefully regulated experiments, the teeth of animals have been made to decay by withholding certain mineral elements and vitamins from the diet. The decay was arrested when these food elements were again introduced.

Milk is the chief source of calcium. Other sources are egg yolks and such vegetables as cauliflower, dandelion greens, spinach, celery and carrots.

A diet containing an ample amount of milk, fresh fruits and vegetables, with a limited amount of sugar, along with plenty of sunshine, exercise and fresh air does something that prevents the formation of decay in the teeth of children.

The entire program of the dental department stresses regular trips to the dentist, proper home care of the teeth and attention to correct diet. It also keeps before the girls and boys the fact that good, clean teeth, kept in repair, are elements of good health and respectability and help to keep them well, useful, and happy.

XUM

DEPARTMENT OF
ORAL SURGERY, ORAL PATHOLOGY AND SURGICAL ORTHODONTIA

PRIMARY AND SECONDARY REPAIR OF CLEFT LIP*†

W. S. KISKADDEN, M.D., AND E. F. THOLEN, M.D., LOS ANGELES, CALIF.

THE presentation of this paper is prompted by a recent review of our results after seven years of cleft lip and palate surgery. During this time 190 operations upon 161 patients were performed for cleft or harelip. There were two deaths. It is only natural that during such a period a gradual evolution should take place. Various well-established methods have been tried and either adopted or abandoned according to the results obtained. It is our intention to outline briefly the operations and procedures that have been useful and are now being employed in the primary and secondary repair of cleft lip and its associated deformities.

Surgery directed to the repair of cleft lip and cleft palate is difficult, tedious and frequently disappointing, yet it is perhaps the most important of all reconstructive surgery of congenital deformities. Many of these cases, for no apparent definite reason, appear in the lower one-third of society. Hence the associated speech defect and facial disfigurement, unless well repaired, will offer a tremendous handicap for future economic efficiency.

The incidence of cleft lip and cleft palate in general practice does not seem great, yet according to Staige Davis,[6] approximately 1 case in every 1100 births will have a lip or palatal defect. Of these, 70 per cent occur in the male. The lip is involved in 83 per cent of these cases; in 25 per cent the lip alone is affected; 75 per cent have clefts of lip and palate. The palate is involved alone in 12.5 per cent, and the alveolar arch or process in 4.5 per cent.

It is our feeling that any surgery of cleft lip is deficient if the patient has any trace of the pre-existing deformity. The ordinary postoperative cleft lip facies, characterized by a tight and frequently long upper lip and a flattened flaring nostril, is familiar to all of us who see these cases. Hence our aim is to err on the radical side and to have the lip too short and pouting, rather than the converse.

TYPE OF CLOSURE

Single Clefts.—In the repair of single lip clefts, use of the Rose, Thompson and Mirault operations have all given good results. Recently we have used the Mirault operation revived,[1] developed, and minutely explained by Vilray P.

*Read before the Southern California Medical Association, Coronado, California, April 11, 1931.

†Reprinted from Western Journal of Surgery, Obstetrics and Gynecology **40**: 18, 1932.

Blair, and feel that it is the most satisfactory because it aids in avoiding notching and also that frequent unpleasant redundancy of the vermilion border which occurs when an excessive bit of mucous membrane fails to contract. Likewise it includes a satisfactory plan for making the nostrils symmetrical and forming a floor for the vestibule. The Mirault is probably the most difficult, but the plan permits lengthening if, as so often happens, one lip element is shorter than its fellow. There can be no question that closing the lip on a zigzag line avoids retraction. Likewise the unpleasant notching of the vermilion border is entirely avoided by using a flap as outlined so well by Blair.

A *B*

C *D*

Fig. 1.—C 29-1906 F. M. Mirault operation. The slight indentation of the vermilion border is somewhat softened in *D*, a later picture. The nostrils are nearly symmetrical.

XUM

We undermine the skin and mucous membrane slightly in closing to relieve tension, and gain better approximation. It has not appeared necessary to close in three distinct layers, i. e., skin, muscle and mucous membrane as is done by Gillies and others. However, one or two catgut sutures to approximate the muscle will avoid the slight hollowing found in many lip scars due to muscle retraction or poor apposition of the cut fibers. We have had no experience in electrical stimulation to gain exact muscle apposition as practiced by Davis and Ritchie. This refinement is, however, worthy of trial.

Lips that have only a slight notch and equal lip elements are easily corrected by the Rose procedure, but we continue to use a vermilion border flap, one side overlapping the opposite and, at least, have our vermilion border scar out of line with the lip scar.

The postoperative care of these cases is important. A Logan bow or arch is used to take tension from the sutures and to elevate or pouch the lip so that it is raised away from the tongue and also from danger of excessive irritation or infection during feedings. The incision and stitches are touched with compound tincture of benzoin followed by yellow oxide of mercury. No gauze dressing is applied. Frequent daily cleaning of the wound with hydrogen peroxide, followed by application of yellow oxide, suffices. There is but little reason for stitch marks on a lip, for if a suture is tied loosely and without tension, as all such sutures should be, and is removed early, no depressed or white cross-line stitch scars will be made. It is our habit to remove some stitches beginning on the second or third day, and all by the sixth. The arch remains on from eight to ten days.

Double Harelip.—Double cleft lip presents many very difficult problems for a satisfactory end-result. Each case is a problem in itself. At one time it appeared that in a certain few cases where the lateral lip elements were large and not too widely retracted it might be possible to bring them together in the midline, and raising the skin of the prolabium to tube it and form a columella. This procedure avoids the wide Y-shaped scar, the long upper lip, and does succeed in forming a columella. Unfortunately, it is difficult always to give a natural shape to the nostrils, and also there is a tendency to sacrifice too much vermilion border, making the mouth appear much smaller than is actually the case. We have tried this procedure in three cases with fair results, but further study and a careful selection of cases are necessary. The usual plan is to incorporate the skin of the prolabium within the lip and at a later date, tube it to form and lengthen the columella. At the same time we excise the rather wide Y scar and do any other indicated rearranging.

Occasionally the septum in its growth will utilize the prolabial skin and automatically form a columella. This is not the rule, however; and this skin should be raised into the columella in order to shorten the lip and more accurately to appose the muscle fibers, which of course are separated by the presence of the prolabium.

Under no circumstances should the premaxilla be removed. Occasionally it will project to such an extent that it will not seem possible to replace it in any sort of alignment with the two lateral halves of the alveolar arch. Often after sacrificing a triangular bit of vomer one will find that, after wiring it into posi-

XUM

tion against the two freshened alveolar shoulders and then closing the lip, the cosmetic result will be good. Examination of such a case at a later date will usually show a fairly symmetrical arch, the lip pressure having molded the premaxilla into position. Care should be exercised that the premaxilla is not tipped during this procedure, as the teeth may later tend to point back.

Formerly we used wires rather extensively in both single and double cleft lips, where the separation of the palate seemed excessive. At the present time

A *B*

C *D*

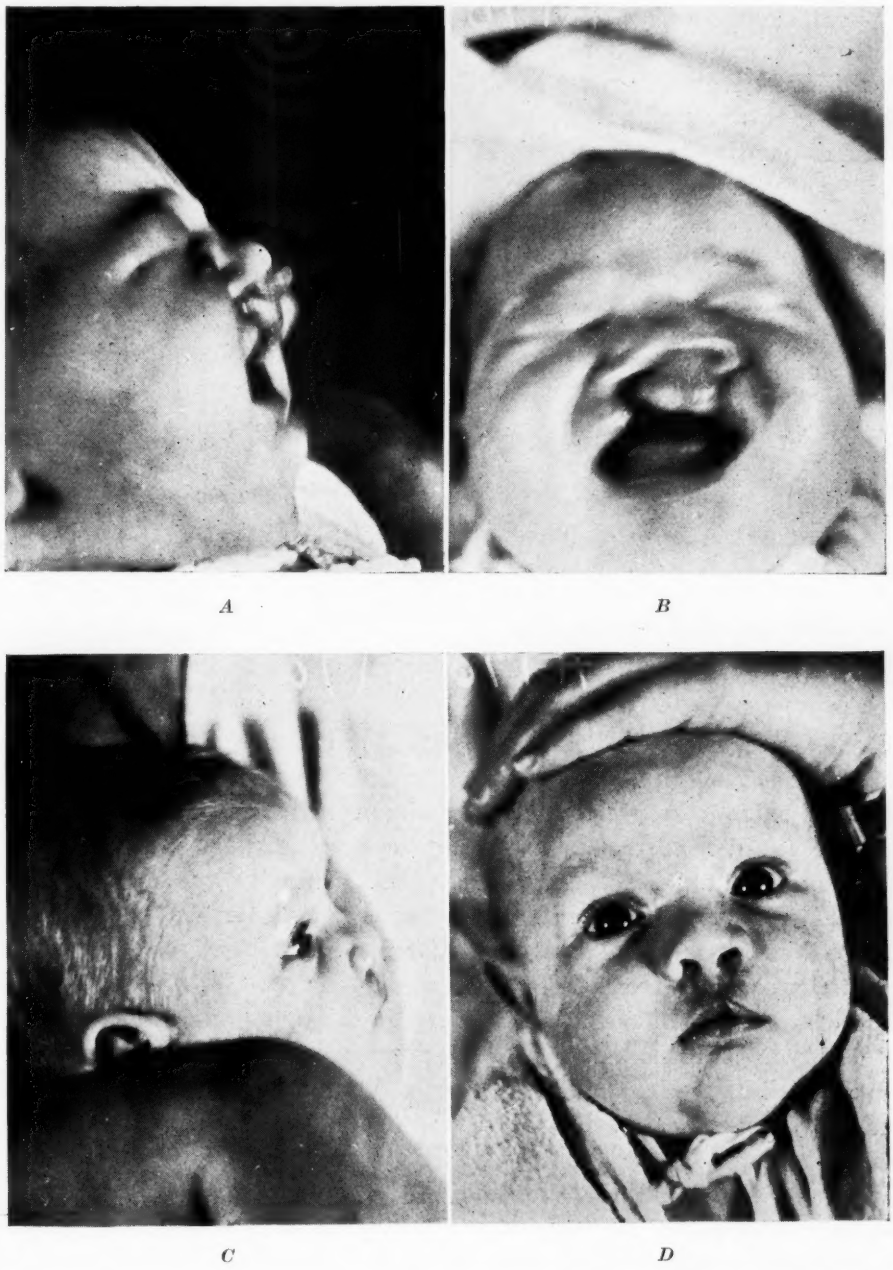
Fig. 2.—C 30-1756 R. V. Mirault operation. Because of age of the patient (four years), the alveolar arch had to be broken and wired into position. Three weeks later the lip was closed. Picture ten days postoperatively. Note the equal curve of the nostrils. The slight scarring is the result of crusts being allowed to form. Fortunately the scarring did not prove permanent.

XUM

one wire usually suffices, and in early cases with but moderate separation we rely on the closure of the lip to mold the arch in position.

SECONDARY PROCEDURES

In the treatment, repair and correction of cleft lip and its associated deformities many additional procedures, in addition to actual closures of the lip, must be carried out. Most of these children present in addition to cleft of the



A *B*

C *D*

Fig. 3.—30-1630 G. U. Double cleft lip. The prolabium was left in the lip and may be excised or raised into the columella later. Note the protrusion of the prolabium in *A* and the profile of *C*. Result ten days postoperative.

lip, deformities of the septum, the underlying alveolar arch, nose, columella and alae. Frequently the nose is crooked, the point being out of line, and in the case of the single cleft lip, usually away from the cleft. The septum in these cases is likewise distorted and brought over to the unaffected side and away from the cleft. The alae are frequently flattened and the cartilage is deficient. Very often the alae are attached to the underlying bone. In the cases where bilateral division of the lip exists, the deformity may be variable. The two lateral lip elements may be unequal in length with an accompanying unbalanced vermilion border. Often the premaxilla will be protruding.

Reconstruction of Vermilion Border.—Many old cases are left with a long upper lip, the vermilion border being quite hidden by its retraction. Here we resort to the Gillies cupid bow operation. This procedure consists in outlining upon the upper lip the exact shape and position desired for the new vermilion

Fig. 4.—C 29-5765 W. U. Double cleft lip. The lip elements have been brought together with a minimum of prolabium in the lip. Note that the profile is symmetrical.

border. The skin between this new line and the old irregular line is sacrificed, and the mucous membrane is, after undermining, resutured to the new border. It is Gillies' habit to snip a few fibers of the orbicularis muscle a little to each side of the midline. If the lip is not hopelessly long, it is worth while not to separate skin from mucosa at the central point. These two procedures will tend to give a pleasing eversion of the central portion of the upper lip. It is really remarkable how an ugly, uninteresting lip may be transformed by this operation into one that has character and is pleasing.

The excision of skin in the above must be adequate, allowing sufficient exposed muscle to give a good body to the new border. Often, however, because of an associated flat nose and short columella one must conserve the skin in order to construct a longer columella and raise the tip of the nose. Excision of the lower lip is elective depending upon its redundancy. It may not be necessary, since with the eversion and shortening of the upper lip we may find the lips symmetrical.

The opposite type, that is with the tight, very short upper lip, may be lengthened and broadened by inserting a pedicle from the lower to the upper lip. This pedicle is formed by the excision of a central whole thickness wedge or

XUM

V. One edge of the V is left attached, and the flap is rotated and sutured in to the upper lip. One week or ten days are sufficient to wait before cutting this flap, since the blood supply is excellent. This operation, described by Abbe, is especially adapted to the right and short upper lip with a deficient border. The indications for this procedure are few, and we have used it once with fair results.

Lip Advancement.—Many old repaired cases present a retracted upper lip. Such a condition may have as a basis:

1. Tightness due to lack of tissue.
2. A flattened alveolar arch.
3. Deficient columella with a deep insertion.
4. An adherent scar.

These patients present an extremely ugly profile. It can best be described as somewhat dish-faced, with a protruding chin and redundant lower lip, and a

Fig. 5.—C 29-R. S. The nose in this old cleft lip is very definitely out of line, as is shown by the highlight on the tip. This is due to the crooked septum. There was also some redundancy of the skin over the left nostril which was excised at the time of the septum operation. Postoperative five days.

retracted upper lip and nose. Unfortunately, in many of these cases there is a real deficiency in the alveolar arch with the teeth very irregular, even coming aimlessly through the roof of the mouth. Reconstruction of this region presents many problems.

The procedure advocated by V. P. Blair[3] of advancing the cheeks and lip on the face by wide lateral incisions in the upper alveolar sulcus has given excellent results. We use it routinely in all cases wherein the lip in profile is at all recessive, and we feel that almost without exception the profile is immensely improved. Invariably the columella is deeply attached and retracted at its insertion in the lip and must be freed from the septum and reinserted as high as possible.

The nose is entirely raised from the face in this procedure, and at the same time an attempt is made to undermine the skin over the alae, thus mobilizing

them. A wire held in place by shot may be introduced at each alae angle to help maintain and hold the nose and nostrils in a narrow and overcorrected position. There is a tendency for the shot or plates to dig into the nose and scar it, hence daily inspection is necessary. Although it is frequently difficult to place deep catgut sutures, they are to be preferred to the use of the wire.

Fig. 6.—C 29-839 L. S. This case was sent to us for the correction of the retracted upper lip and the hidden vermilion border. Blair's advancement and the cupid bow operation were used. Result ten days postoperatively. Note secreting glands of lower lip. Nostrils need later correction.

We have found it of value to convert our transverse sulcus incision to a T when closing this wound. This, in addition to aiding the advancement, also gives a higher sulcus and hence a more pouting lip. A Logan arch is used to take tension from the sutures and to hold the tissues in an overcorrected position.

XUM

In cases presenting a really bony defect or deficient arch, the lip and base of the nose may be brought forward by cartilage implants or permanent prosthetic appliances attached to the teeth. Since a plate is usually necessary, we prefer, if possible, to rely upon this means of pouting the lip after providing a satisfactory sulcus.

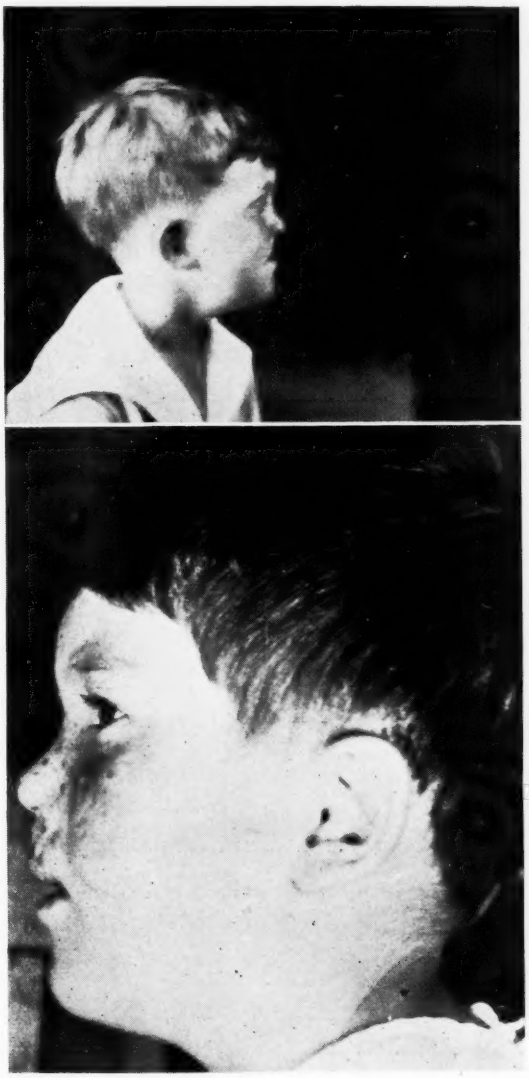


Fig. 7.—C 29-2137 F. M. This case was sent to us for correction of long retracted upper lip. The vermilion border was entirely hidden by the lower lip. Blair's advancement, coupled with Gillies' cupid bow operation, gave the result in the lower picture.

If the sulcus is deficient or has been obliterated by scar, it will hold the lip down. This may be corrected by excision of the scar and epithelization of the area forming a new sulcus after the procedure of H. D. Gillies, or in the less severe cases, by closure in the form of a T as noted above.

Notched Borders.—Should notching occur in the mucous membrane of the lip because of scar contraction, the conversion of a V to a Y-incision will allow

the mucous membrane to come into position. Notching carried into the skin can be corrected by a diamond-shaped excision with straight line closure, after the plan of Berry and Legge.

An uneven or irregular vermilion border may be corrected by the excision of a triangular bit of skin from the lip, the long side of the triangle being on the uneven or upper border. This, combined with the above procedure for notching, will correct many uneven primary repairs. This procedure is especially good if the scar is wide and ugly. Otherwise the textbook Z-incision of Berry and Legge avoiding incision of the skin of the lip and confining all the repair to the vermilion border and the mucous membrane, will give good results.

Nostril Excision.—As a rule the nostril in a single cleft presents some deformity. It may be flattened due to its lateral spread with the opening rotated to a transverse position.

Fig. 8.—C 30-1815 R. G. This patient, operated upon elsewhere, is shown simply to illustrate what happens when a premaxilla is excised.

The alae must be entirely mobilized before it is possible to correct their position. In some cases where the skin is tightly adherent it will be found advantageous to make an incision through the mucous membrane at the superior border of the alar cartilage, and then, exerting traction on the cartilage, to dissect it free of the skin. Of course, the mucous membrane is likewise freed. There will be a prolapse of the mucous membrane which may appear to occlude the canal. Several mattress sutures tied over gauze on the outside of the nose will suffice to "tack" or hold it in place. Following the correction, the ala is held in position by shot or a deep catgut suture.

Excision of a diamond-shaped or triangular bit of skin from above the distorted and displaced nostril will aid in making it symmetrical. This excision should be through the skin and fat, and often, to be adequate, must include the skin or mucous membrane on the nasal side. The septum is usually off center.

XUM

Raising of the mucous membrane of the septum on both sides, refracture of the septum and the complete freeing of its attachment to the vomer and columella, with replacement, are usually adequate. Undermining of the skin over the bridge is essential for complete mobilization.

Many cases presenting a cleft in the alveolar arch as well as the lip frequently have only a short, thin skin bridge to form the floor of the affected vestibule. We have in these cases raised a flap of mucoperiosteum from the more prominent arch and a smaller flap from the opposite arch and sutured them into the defect thus gaining a floor for the future canal.

CONCLUSIONS

1. We desire to emphasize the value of the Mirault operation for the closure of single harelip. Credit for working out so well the many details and reviving this operation is due V. P. Blair and J. B. Brown.

2. A plan is offered for the closure of double harelips. In selected cases it will avoid the short columella, the long retracted upper lip, excessive scarring, and will gain a more exact muscle apposition.

3. Attention is directed to the cupid bow operation of Gillies, which permits correction of deficient, hidden and retracted vermilion borders and likewise shortens the lip.

4. Lastly, we desire to emphasize that this type of surgery belongs in the hands of the specialist. Secondary procedures are always difficult but are rendered doubly so by earlier poorly planned surgery.

REFERENCES

1. Blair, V. P., and Brown, J. B.: Mirault Operation for Single Harelip, Surg. Gynec. & Obst. **51**: 81, 1930.
2. Parker, Douglas B.: Clefts of Palate and Lip, Am. J. Surg. **14**: 385, 1928.
3. Blair, V. P.: Problems of Bringing Forward the Retracted Upper Lip, Surg. Gynec. & Obst. **42**: 128, 1926.
4. Blair, V. P.: Why and How of Harelip Correction, Ann. Oto. Rhino. & Laryng. **37**: 196, 1928.
5. Brown, G. V. I.: Nasal Rotation in Harelip Operation, J. A. M. A. **77**: 1927, 1924.
6. Davis, J. S.: Incidence of Congenital Clefts of Lip and Palate, Ann. Surg. **80**: 393, 1924.
7. Davis, J. S.: Plastic Surgery, 1918, Philadelphia, P. Blakiston's Sons and Co.
8. Logan, W. H.: Surgery of Cleft Palate and Cleft Lip, J. A. D. A. p. 1095, June, 1927.
9. Morehead, F. B.: Correction of Congenital Cleft Palate and Harelip, J. A. M. A. **77**: 1951-1953, 1921.
10. Federspiel, M. N.: Harelip and Cleft Palate, J. A. D. A., April, 1922.
11. Lyons, C. L.: Operative Procedure in Cleft Palate and Harelip, J. A. D. A. **14**: 1080, 1927.

XUM

FIBROMA, WART, DIFFUSE PAPILLOMA OF MOUTH AND TONGUE

(LESIONS OF THE ORAL CAVITY AND OF THE JAWS AND OF THE REGION OF THE JAWS, INCLUDING THE TEMPORAL FOSSA, ORBITAL CAVITY AND SINUSES*)

(Continued from page 747)

JOSEPH COLT BLOODGOOD, M.D., BALTIMORE, MD.

THIS seems to be a local reaction to a single injury. The most common is the bite of a tooth or the scratch by a ragged tooth. Now and then the factor is an injury by a bone or a sharp foreign body. In a few instances the prick of a hypodermic needle during a local operation on tonsils has been the only factor. Similar fibromas have been observed on the skin from similar factors. These

Fig. 10.—Pathol. No. 32127. Fibroma of the tongue opposite a ragged, decayed tooth, of eight years' duration. Recent superficial ulceration. Complete excision in 1922. Well in 1929, seven years later.

fibromas are practically keloids, that is, scar tissue tumors. The little injury which produces, as a rule, an insignificant wound, often subcutaneous, is followed by excessive local reaction—first, granulation tissue, then excessive fibroblasts and fibrous tissue. Keloids and fibromas do not follow every insignificant injury and are rather rare tumors suggesting some individual factor similar to ossifying myositis after a single trauma or sarcoma.

Tobacco, lues or the factors of leucoplakia are not present. The fibroma may be situated anywhere on the mucous membrane of the mouth. It is most common on the lateral surface of the tongue and on the mucous membrane of the cheek, that is, areas most readily bitten by the teeth. To repeat, it has no relation to syphilis. The little nodule forms quickly after the injury, rarely reaching a size larger than a large pea. The mucous membrane becomes ulcerated only when the teeth continue to rub its surface. In about thirty cases of fibroma the duration of the disease has varied from a few months to fifteen years. The

*One of a series of articles by Dr. Bloodgood that will appear in the JOURNAL over a period of eighteen months to two years. Originally published in *Lewis' Practice of Surgery*, W. F. Prior Company, Inc., and brought up to date.

XUM

majority of the patients have sought advice within a year. The enlightened individual now comes at once.

Fig. 10 shows the ordinary picture of a fibroma with a slight superficial ulceration on the top. The white patch is a high light.

Figs. 11 and 12 show the microscopic pictures.

RELATION OF FIBROMA TO CANCER

No cancer of the tongue has as yet given a positive history of a fibroma, and fibromas are most common on the tongue. But in two cases of cancer of the mucous membrane of the cheek, both operable and cured by operation, and in two examples of sarcoma of the cheek, both inoperable and hopeless, the four

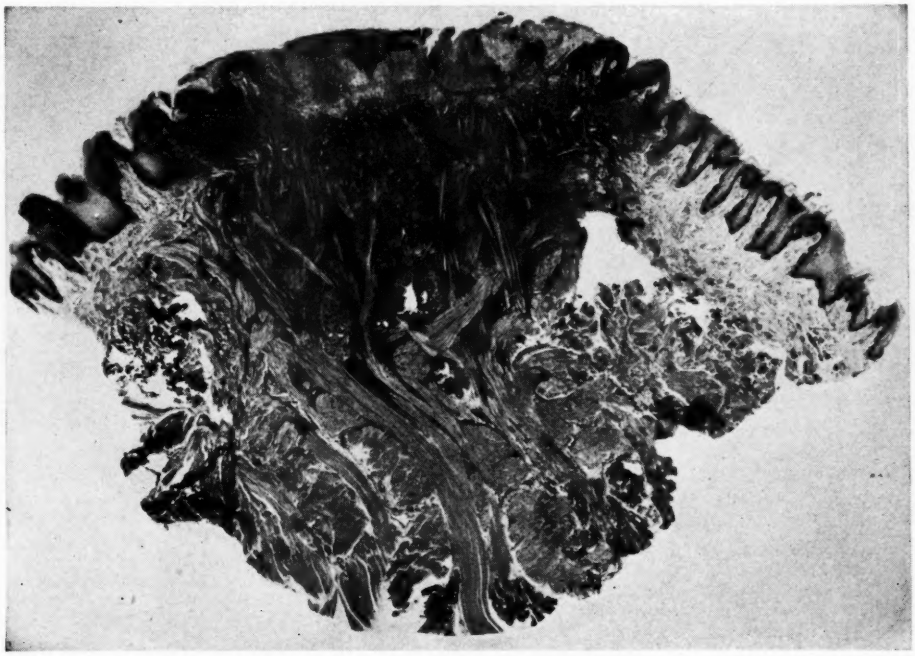


Fig. 11.—Pathol. No. 21194. Photograph through a section of a fibroma in the center of the tongue. Gross appearance as in Fig. 10. The tumor was of two weeks' duration and was observed one month after the prick of a needle during an operation on the tonsils. The nodule was excised in 1921. The patient is well eight years later, in 1929.

patients gave a definite history of a nodule in the cheek of long duration before the tumor enlarged and ulcerated. For this reason I think it safer to remove the fibroma completely when it is situated on the lateral surface of the tongue or the mucous membrane of the cheek, if it does not disappear within a few weeks or months.

There is no danger in waiting to see whether the fibroma which has developed after an injury will disappear. When the fibroma is situated on the dorsal surface of the tongue, well away from the edge and tip, there is no danger in waiting even months. But fibromas of the type shown in Fig. 10 should be immediately removed.

KELOID TUMORS OF THE MUCOUS MEMBRANE OF THE LOWER LIP

When nodules have been removed from the mucous membrane of the lower lip, usually of the type of labial gland adenoma or cyst, keloids often form in

the scar. My experience teaches that it is safer to leave these keloids alone, as each operation for recurrent keloid prolongs the duration of the resultant keloid. When one completely excises a V-shaped piece of the lower lip, keloid does not occur. Nor have we observed keloids after the excision of fibromas of the tongue and mucous membrane of the cheek.

Microscopically, these fibromas or keloids are often very cellular, and many have been diagnosed microscopically sarcoma. We all know the difficulties in some instances of differentiating sarcoma from granulation tissue. Even fibroblasts in the early spindle cell stage look very much like the spindle cells of sarcoma, but, if fibroma is given a good margin—and it is always possible to do this without mutilation, one need have no anxiety. I have the records of all

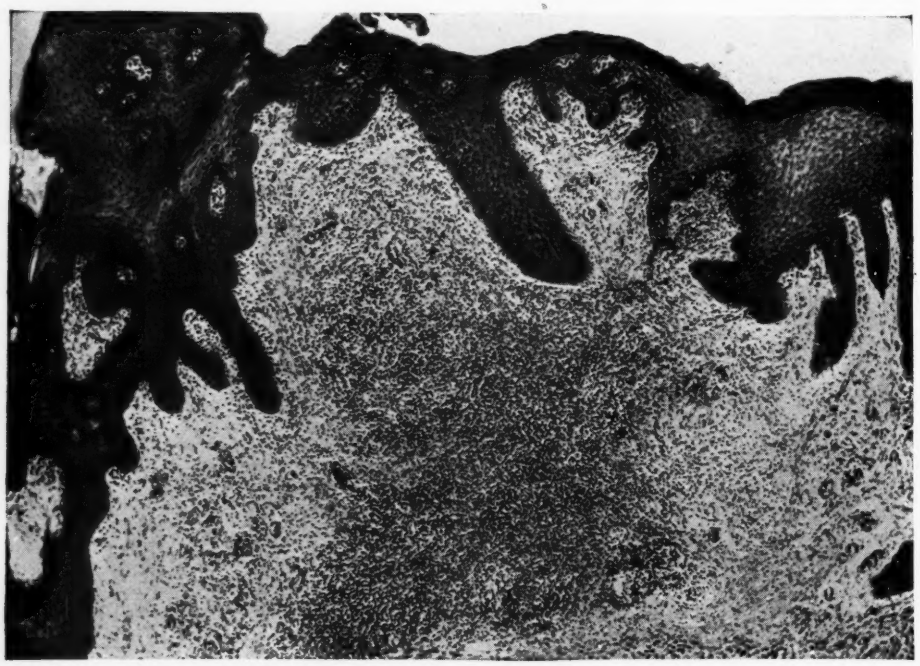


Fig. 12.—Pathol. No. 18668. Photomicrograph, low power, of a fibroma of the tongue. Excised in 1915, well in 1928, thirteen years later. The nodule was situated on the tip of the tongue and had been present eighteen months. It followed biting the tongue. The section shows slight hypertrophy of the epidermis, but no leucoplakia. Compare with Figs. 7 and 8. Beneath the epidermis, lymphoid-cell granulation tissue.

the fibromas of the oral cavity operated on since 1906. Microscopically all closely resemble Figs. 11 and 12. In not a single instance is there a record of a recurrence.

WART

Not infrequently the little wart looks like a fibroma (Figs. 13, 14 and 15).

The majority of these warts were on the tongue, but both leucoplakia and fibroma in the benign stage are more common than is the wart. As a rule, when the wart is excised, it must be placed among malignant warts or early cancer, as the base shows cancer. In the majority of instances the warts are small, the surface has the distinct appearance of a wart, around the base of the wart there is evidence of leucoplakia, and there may be other patches of leucoplakia

Fig. 14.

Fig. 13.

Fig. 13.—Pathol. No. 24424. Photograph showing a wart or fibroma on the tongue. White male, aged forty-five years. Lesion of one month's duration, from irritation by a tooth. There are also patches of leucoplakia of the mouth; excessive use of tobacco; teeth rather neglected. Clinical diagnosis—fibroma. For gross and microscopic appearances see Figs. 14 and 15.

Fig. 14.—Pathol. No. 24424. Photograph of the specimen excised from the tongue shown in Fig. 13. For microscopic appearance see Fig. 15. The little specimen has the gross appearance of a fibroma.

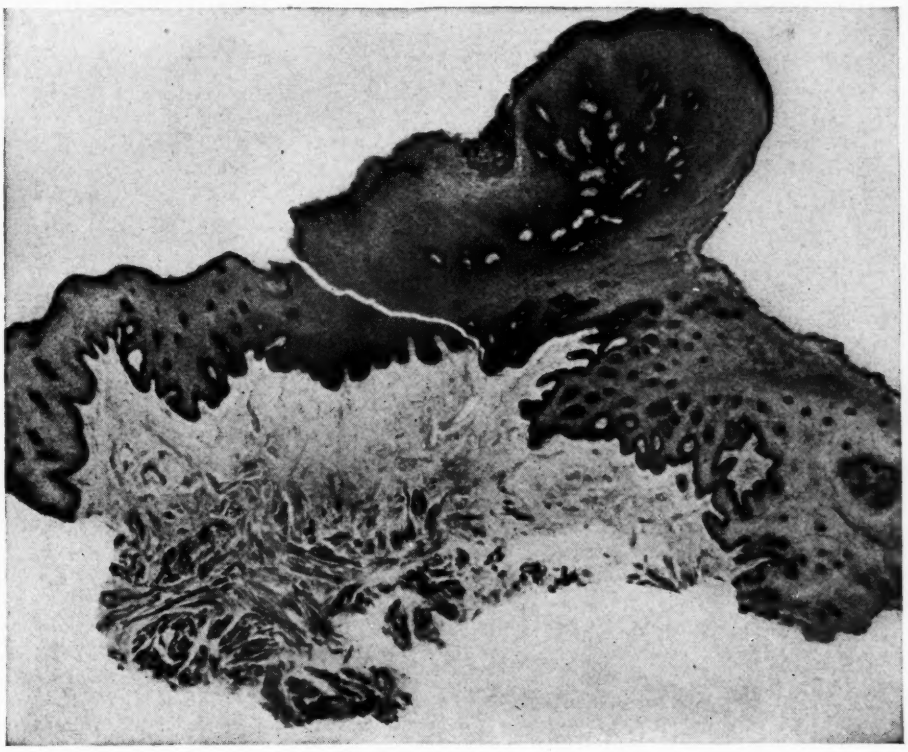


Fig. 15.—Pathol. No. 24424. Photomicrograph, low power, of specimen shown in Fig. 14. The tumor projecting from the tongue and having the smooth appearance of a fibroma is composed entirely of epidermis with very little inflammatory reaction beneath. The mucous membrane of the tongue around this epithelial growth shows hypertrophy and slight early changes of leucoplakia. Complete excision in 1919. Well nine years later, in 1928.

in the mouth. That is, leucoplakia is the chief cause of warts. Fig. 16 pictures the usual appearance of a wart in leucoplakia. I was surprised, after excision, that it was still microscopically benign.

Apparently there is the same relation between warts and cancer as between leucoplakia and cancer; but for leucoplakia, removal of the cause is sufficient,

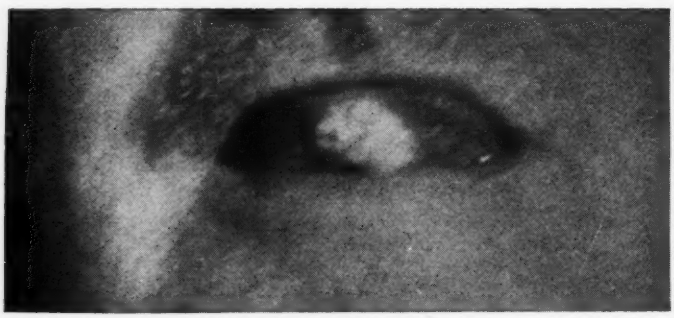


Fig. 16.

Fig. 17.

Fig. 16.—Pathol. No. 39738. Photograph of a wart below the tip of the tongue, in a male aged sixty-eight years. He has used tobacco in excess, has never seen a dentist, his teeth are ragged and dirty. He has known of a white patch in the position of the wart two years, and has observed the wart six weeks. There has been no recurrence since its excision in October, 1927. To complete the cure, we have extracted all the teeth. For macroscopic picture see Fig. 17.

Fig. 17.—Pathol. No. 39738. Photograph of section of wart shown in Fig. 16.

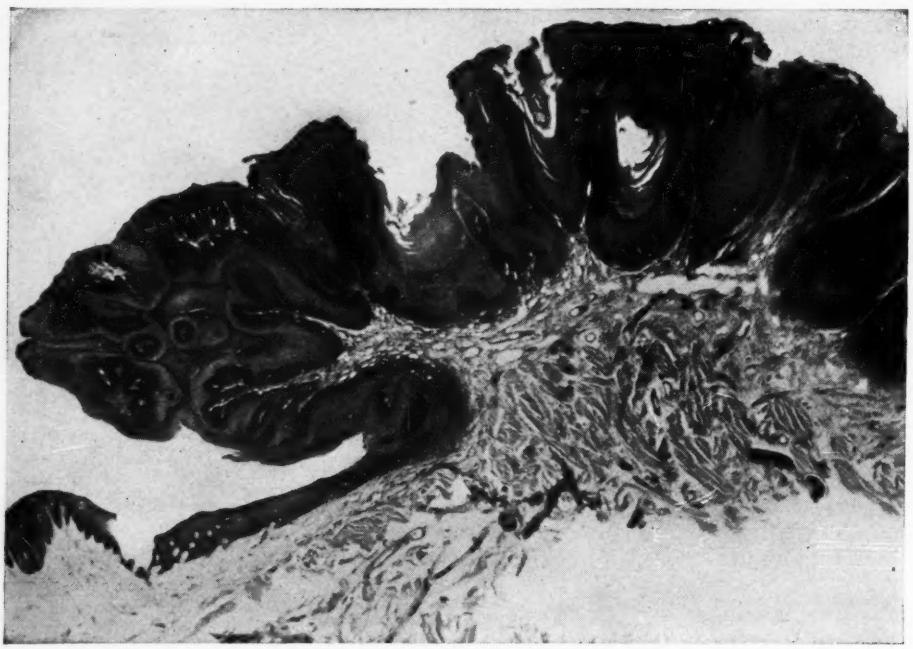


Fig. 18.—Pathol. No. 39738. Photograph of the entire section of the benign wart shown in Fig. 17.

while for the wart not only must there be removal of the cause but the wart itself must be excised with a good margin of healthy tissue, on the supposition that it may possibly be malignant. In the first decade up to 1900 we have a record of but a single benign wart. In the next decade—to 1910—there are six cases, in the third decade—to 1920—eleven cases, while since 1920 we have observed

fifteen cases. As the relative percentage of benign warts increases, the number of cancer in warts decreases. In none of these cases in which warts have been excised since 1894 have there been any recurrences. The chief cause of the wart is leucoplakia, the next irritation from a tooth or a single injury as in fibroma. Apparently warts on the tongue and mucous membrane of the mouth have no tendency to disappear spontaneously as have warts on the fingers and scalp. We have observed one congenital wart and two in children. All of the others appeared after the age of twenty-five years.

DIFFUSE PAPILLOMA

Up to the present, when the lesion has been excised, many of these cases have shown malignant changes at the base. They are more likely to be observed

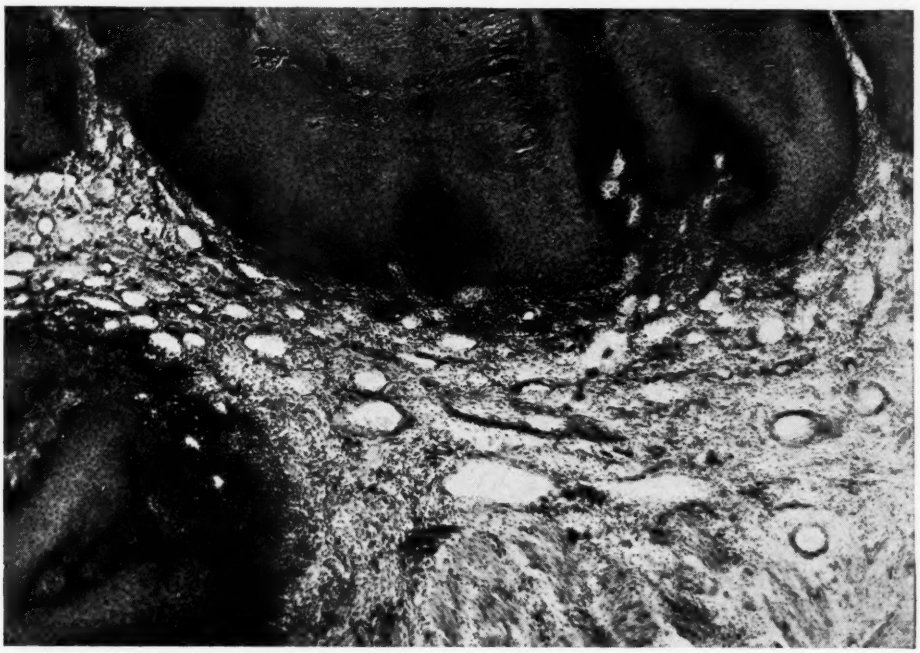


Fig. 19.—Pathol. No. 39738. Photomicrograph, low power, of an area in Fig. 18. Note that the basal-cell layer is everywhere intact. Malignancy has not yet begun. Yet, in the wart shown in Fig. 9 the microscope revealed the beginning of malignancy.

on the mucous membrane of the cheek or floor of the mouth, and are always associated with tobacco and bad teeth. Complete excision is often mutilating and, as a rule, has failed to cure. Our best results have been from a combination of excision with the cautery and radiation.

When the above was written on diffuse papilloma I made a note to restudy and rewrite it. The difficulty is that in the past ten years no individual has waited until the wart has become a diffuse papilloma or a cancer. It is a very late stage.

Among the old cases, two stand out prominently. One is a diffuse papilloma of the floor of the mouth on both sides but not involving the tongue or the cheek. It was removed with the scissors through the mouth, without splitting the cheek, by my colleague Dr. Winslow, then professor of surgery of the University

of Maryland. The microscopic sections revealed chiefly a benign papilloma. There are areas about which pathologists might differ as to malignancy. The patient was then referred to Dr. Kelly who gave a very thorough course of treatments with radium packs. After this a mass in the neck developed, so hard and so infiltrating that it suggested a hopeless stage of cancer. I partially removed this mass. The sections show myositis. It was one of our early experiences with cellulitis and myositis due to irradiation, but in this instance there was no ac-

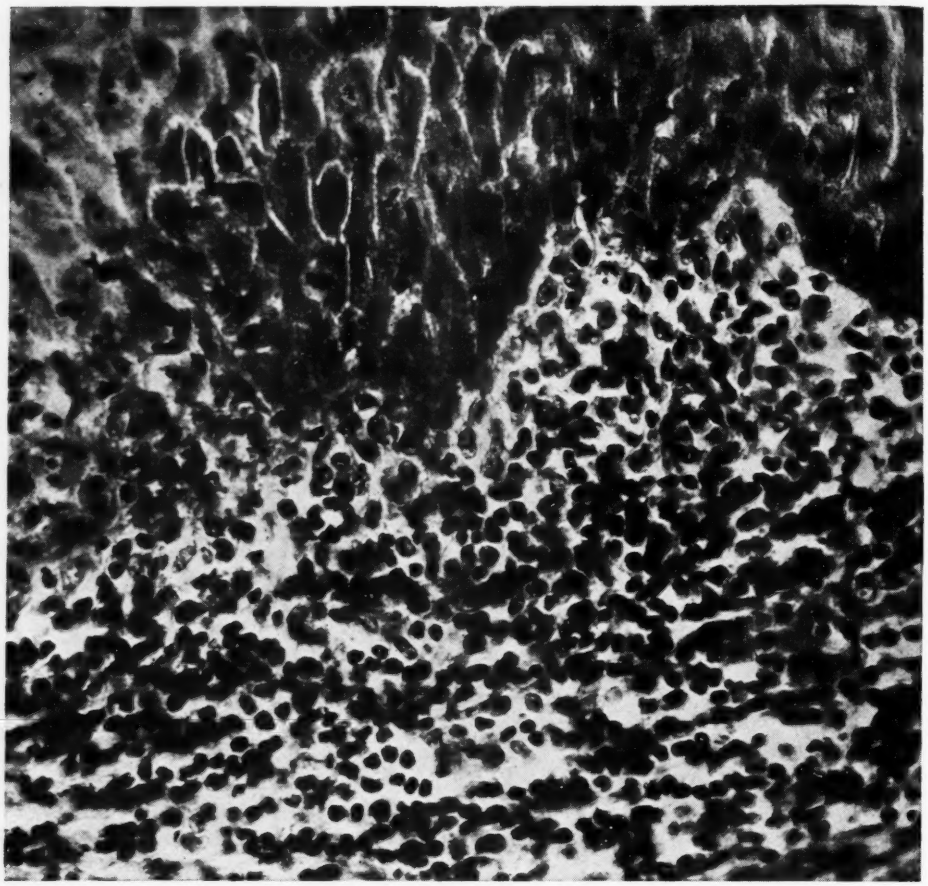


Fig. 20.—Pathol. No. 39738. High-power photomicrograph of the border of the epidermis and the subepidermal tissue shown in Fig. 19 of the wart shown in Fig. 17. To the right the basal cell is preserved. To the left the basal cell is gone, and all the cells of the epidermis at the left edge show a changed morphology and a changed staining from the normal epidermal cells to the right. This may be the beginning of cancer in this wart. There has been no recurrence since its removal two and one-half years ago.

companying dermatitis. I have observed this patient two or three times a year for seventeen years. There is no sign of recurrence; the indurated mass in the neck which was not removed gradually disappeared. The result here seems to show that the local growth had been completely removed at the first and only operation.

About the same time there was a second case in which the papilloma began at the angle of the mouth and extended to the cheek. The operator looked upon it as benign and gave it a narrow margin in order to avoid mutilation. The sec-

XUM

tions from this tissue and from three local recurrences in the cheek showed benign papilloma. The sections from the fifth operation for a recurrence in the scar showed cancer. There followed a sixth operation with the complete radical removal of the growth and glands; then recurrence and death.

Should a patient present himself with a diffuse papilloma of the oral cavity in which complete excision with the cautery would be mutilating, I believe it would be wiser to try radiation first, because some papillomas or warty growths are distinctly radiosensitives.

APPENDIX

Although this was written more than four years ago, I have no corrections to make of any of the statements, nor has there been any recurrence in any of the cases reported then. At the present time the number of benign lesions is still on the increase, and the percentage of malignant lesions on the decrease. The following additional statements seem not to be out of place, may interest the reader, and increase his knowledge.

Fibroma of the tongue is apparently a relatively common lesion as compared with the tumor in other parts of the body, and for the number of fibromas observed in the oral cavity, the number of sarcomas is relatively small. Nevertheless, as stated here, it is wiser to remove all fibromas which have been produced by the irritation of a tooth or an ill-fitting plate, even when the cause may be eliminated. When a fibroma is removed, it should be given sufficient margin of tissue on all sides, and it is safer to check the pathology of the palpable area and the margin given the growth at the operation by frozen sections. There is no particular advantage in treating a fibroma by preoperative or postoperative radiation. When there is a definite history of a bite by a normal tooth or of a foreign body and the resultant fibroma is not in the zone which can be traumatized by teeth or plates, there is no risk in leaving it alone, as often it disappears spontaneously.

In other parts of the body, these little subcutaneous nodules when removed proved to be spindle-cell sarcomas, and recur when they are not completely removed. This afternoon I was looking at a section of a small subcutaneous nodule removed from the skin situated beneath the right breast of a surgical colleague. Although the section was stained in 1913, nineteen years ago, every cell showed as clearly as in a freshly stained section. There was very little intercellular substance; the more the intercellular substance, the less malignant the tumor. So that these tumors may be called fibroma, cellular fibroma, fibrosarcoma and spindle-cell sarcoma. The fibromas of the tongue and of the mucous membrane of the mouth are quite cellular.

To return to this spindle-cell sarcoma removed nineteen years ago, there has been no recurrence. The surgeon observed a nodule the size of a pea about two months after a trauma, and it was removed within one week after he had first felt it. He sent the tissue to me with the following written statement: "Please telegraph me if it is malignant, and I will come on at once for the complete operation." The tissue received was an elliptical zone of skin about 3 by 2 cm. in diameter removed with a mass of subcutaneous fat and a bit of the fascia of muscle. In the center, beneath the epidermis of the skin and attached to the

XUM

epidermis, was a nodule about the size of a large pea. On section, it was circumscribed. One could not tell with the naked eye whether it was a fibroma or a sarcoma. I immediately telegraphed this surgeon as follows: "Your surgeon is such a good operator and has removed the little tumor with such a generous margin that it makes no difference what the microscopic picture is; sufficient has been done." The result today proves the correctness of this statement. Clinically, and from the naked-eye appearance, this subcutaneous spindle-cell sarcoma could not be differentiated from the benign fibroma of the tongue or mouth, or from a benign fibroma of the skin, and that is why these tumors should be given sufficient margin. When situated in the skin, one can give a more generous margin without any harm except a little larger scar. But, in the mouth, although there has never been any difficulty, in my experience, in giving the tumor sufficient margin, one does not want to be as generous as in the skin, and for this reason it is safer to have a frozen section made after removal.

The last fibroma I saw was in one of the great clinics in London. The surgeon was a good operator and a trained radiologist, but not a pathologist. The tumor was on the mid-third of the dorsum of the tongue, almost 1 cm. from the edge; it had been observed a few weeks after the accidental biting of the tongue; it was the size, perhaps, of a large pea. The submucous nodule could be easily palpated. There was no induration about it. It was giving no discomfort. The surgeon in this case was debating between removal and treatment with interstitial needles. From my experience, I would have left it alone. When he decided on removal, he used an electric needle and practically enucleated the tumor. That is, if the tumor had any sarcoma cells in it, it will recur; even if it is benign, it may recur. Nevertheless this surgeon, after removing this little nodule, did not bisect it to look at its fresh appearance—he simply sent it to the pathologic laboratory and remarked to me that he would get a report in a few days. There is no question in my mind that such an operative procedure is dangerous. It would be much less dangerous to leave it alone and watch it. It would be much safer to irradiate it. Incomplete removal of any tumor is worse than no treatment at all. There may be exceptions when complete removal is impossible and when we hope that by incomplete removal with the cautery and irradiation at least temporary relief may be achieved. Today, there is too much surgery of this type in the mouth, and there is too much surgery without pathologic examination, and too much irradiation with radium or x-rays, even by experts, without biopsy. All of these early lesions of the mouth should be cured by surgery or irradiation.

Warts. Within the oral cavity, any local lesion of the appearance of a wart should be treated as a malignant tumor, and, if the lesion is small enough to allow complete excision, this should be the method of choice, and as a rule the electric cautery or the electric needle should be employed and a frozen section made for the diagnosis and the extent of the margin. I have already made the statement that the wart may look benign, but the section may show malignancy beginning at the base. The results should be 100 per cent in both benign and malignant warts when they are properly excised. If the wart is too large, there should be trial of irradiation. The radiologic expert must decide for himself, but from my observations in the London clinic, splendid results, immediate

XUM

and permanent, are being obtained by the interstitial method with radium salts in needles. This allows equally good results with smaller amounts of radium.

Diffuse Papilloma. The choice of treatment is the same as for warts. Complete excision with the electric cautery or with the electric needle if the tumor is small enough. Otherwise irradiation with radium. Always remove the plates, extract irritating teeth; do not leave a tooth behind which is irritating. The patient must discontinue the use of tobacco in all forms. I have no proof that diffuse papilloma has any relation to syphilis. I have seen no examples of diffuse papilloma in the past four years. It is a lesion of neglect in uninformed people.

(To be continued)

ABSTRACTS OF
CURRENT LITERATURE

NUTRITION AND PEDIATRICS

By Samuel Adams Cohen, M.D., New York City

It is the purpose of this Journal to review so far as possible the most important literature as it appears in English and foreign periodicals and to present it in abstract form. Authors are requested to send abstracts or reprints of their papers to the publishers.

Rickets in Sydney, Australia. Kempson Maddox. Arch. Dis. Child. **7**: 37, 1932.

Because of the world wide prevalence of the occurrence of rickets the clinical study of this disease as is seen by Maddox in Sydney, Australia, is of interest. Taking 218 infants in succession as they were admitted to the outpatient department of Renwick Hospital for Infants, Sydney, Australia, this author studied their physical examinations. The ages of these children were between six months and two years. In this series a clinical diagnosis of rickets was made in the presence of two or more of the following: (1) nocturnal restlessness, sweating of the head, general irritability, convulsions; (2) delay in dentition beyond eight months or delay in walking beyond sixteen months; (3) skull changes; (4) definite Harrison sulcus; (5) marked beading of ribs (rosary); (6) marked ligamentous laxity; (7) marked pot belly with enlarged liver.

In addition 129 unselected cases of this series were studied by means of x-ray plates for evidence of rickets. As a result of this study of the entire series of 218 infants 116 or 53 per cent of the infants had unmistakable evidence of either healed rickets or active rickets.

In his discussion of the findings, the author states that Sydney is abundantly supplied with sunshine and that it was difficult for him to believe that a deficiency in ultraviolet rays could be such a decided factor in production of rickets in Sydney. He rightly states that overdressing, which prevents direct exposure by sunlight, poor hygienic surroundings, and disturbance in nutrition must be considered marked contributing factors in the etiology of rickets.

In regard to those in other parts of the world who may have different criteria and standards pertaining to the growth and development of infants, the author contributes a very practical suggestion when he states that perusal of the literature indicates that positive signs and symptoms of rickets vary not only in localities but even in the order of their appearance and frequency.

Respiratory Flora of Eskimos in Remote Northern Regions. J. Ralph Wells and Peter Heinbecker. J. Infect. Dis. **50**: 4, 1932.

In the summer of 1930 these investigators studied the respiratory flora of one hundred and fifty persons in seven isolated groups of Eskimos. This interesting study is unique in that it includes the entire native population of six

XUM

of the seven active localities and 60 per cent of the population of the seventh group. Moreover until the time of study five of the isolated communities had had no contact with the outside world for at least a year.

As a result of their investigation Wells and Heinbecker state that the respiratory flora of these people is in a general way similar to that of persons living elsewhere. Examination of direct smears from the mouth and throat of these individuals in the arctic region revealed the presence of many fusiform bacilli and spirochetes, apparently of the same type as those usually found in mouths of most individuals living elsewhere in the world. The most abundant organisms found belong to the group of staphylococci, many of the hemolytic variety, and to the chromogenic gram negative diplococci. Next in order of frequency were *B. viridans* and many diphtheria-like bacilli.

In passing it may be of interest to mention that a severe case of dental caries was seen in a child, who for some time had been obtaining food from the police station. According to these observers this condition seems to be rare among Eskimos living in their natural state on a pure meat diet.

Studies in the Common Cold. V. The Relationship of Pathogenic Bacteria to Upper Respiratory Disease in Infants. Yale Kneeland, Jr., and Caroline F. Dawes. J. Exper. Med. **55**: 5, 1932.

Kneeland continues to report the results of his fascinating investigations of bacteria and their relation to upper respiratory infection. This investigator and his coworker, Dawes, mention the fact that pathogenic bacteria occur in the nose and throats of humans with or without respiratory infection. Furthermore, it has been demonstrated that pathogenic organisms are a late or secondary invader in their relationship to upper respiratory infection. These authors also report the splendid researches of Dochez and others, who noted that some filter-passing agent produces symptoms by activating the pathogens, which are otherwise latent in the upper respiratory infection.

In regard to infants, the writers mention the observation of Bloomfield, who found that the upper respiratory tract was sterile at birth; Kneeland noted that when the infants reached the age of eight months their basal flora was entirely comparable to that of adults.

With the above facts in mind, Kneeland and Dawes made some bacteriologic investigations from October, 1929, to July, 1931, at the Home for Hebrew Infants, New York City, of the nose and the throats of children whose ages ranged from birth to three years. In the discussion of their results of this clinical and bacteriologic investigation which is reported from the Department of Medicine, College of Physicians and Surgeons, Columbia University, and also the Presbyterian Hospital, the authors noted that the first outbreak of cold in autumn seems to favor the dissemination of pathogenic organisms. In other words, Kneeland and Dawes assume that the "cold" virus makes the soil more favorable for dissemination of pathogenic bacteria, the more frequent and more important ones being the influenza bacillus and the pneumococcus.

The results of their study were in accord with those of many clinical observers in that it was noted that (1) infants during the first few months of

XUM

life are comparatively immune to upper respiratory infection; (2) infants between the ages of eight and fourteen months are highly susceptible to upper respiratory diseases and have more serious consequences; (3) that the repeated and numerous colds which occur in children more than eighteen months of age are merely symptomatic of their chronic colds.

Your Child's Posture. Samuel Adams Cohen. Hygeia **10**: 3, 1932.

The author feels that postural defects in children would be lessened if more thought and attention were given to this important aspect of child health and development. Such items as children's clothing, particularly in the matter of properly fitting shoes and stockings, or children sleeping without pillows on a stiff mattress or on a mattress made firm by placing wooden slats under it, are mentioned merely to indicate how apparently insignificant details of the every day life of the child aids in the proper development of its posture.

Although Cohen mentions malnutrition and chronic fatigue to be among the more prominent contributing factors in the development of faulty posture in children, he also adds, however, that malnutrition and chronic fatigue are often merely secondary results or part of the general picture of faulty posture.

In addition to chronic fatigue and malnutrition, other physical defects swell the number of children having faulty posture. Children who breathe abnormally—that is, through their mouths—have underdeveloped chests and faulty postures. Often enlarged or diseased tonsils, enlarged adenoids or some other mechanical hindrance or interference in the nose or the throat results in the faulty breathing, and abnormal development of posture follows. Far too many children become chronic sufferers of poor posture because they were not taught to breathe correctly.

Good posture means a body mechanism that can function with the greatest efficiency and with the least effort. As a rule, good posture is concomitant with good health, comfort and comparative ease of mobility. On the other hand, a child with poor posture is frequently tired, under par physically, and is subject to various physical discomforts and disturbances. Poor posture almost always develops slowly and is the result of a combination of circumstances, many of which can be prevented.

Moreover, the author holds that, if neglected, faulty posture tends to become worse as the child grows older. This interference of the body mechanism is a distinct handicap to the child's efficiency and appearance, and also occasionally brings with it embarrassment and mental discomfort. Cohen further adds that fortunately, with comparatively rare exceptions good posture is within the reach of all, because faulty posture is a preventable physical defect. The child should be given every opportunity to regularly avail itself of the services of a physician and a dentist so that by virtue of their guidance, skill, knowledge and experience, they will be able to make it possible for the child to be blessed with good posture and thus have the many advantages that go with it.

XUM

The International Journal of Orthodontia, Oral Surgery and Radiography

PUBLISHED THE FIFTEENTH OF EVERY MONTH BY

THE C. V. MOSBY CO., 3523-25 Pine Blvd., St. Louis, Mo.

Foreign Depots—*Great Britain*—Henry Kimpton, 263 High Holborn, London, W. C.; *Australasia*—Stirling & Co., 317 Collins Street, Modern Chambers, Melbourne; *India*—"Practical Medicine," Egerton Street, Delhi; *Porto Rico*—Pedro C. Timothee, Rafael Cordero 68, San Juan, P. R.

Subscription Rates—Single Copies, 75 cents. To any place in United States, Cuba, Porto Rico, Canal Zone, Mexico, Hawaii and Philippine Islands, $7.00 per year in advance. Under foreign postage, $7.40. Volume begins with January and ends with December of each year.

Remittances—Remittances for subscriptions should be made by check, draft, postoffice or express money order, payable to the publishers, The C. V. Mosby Company.

Contributions—The editor will be pleased to consider the publication of original communications of merit on orthodontic and allied subjects, which must be contributed solely to this Journal.

Opinions—Neither the editor nor the publisher hold themselves responsible for the opinions of contributors, nor are they responsible for other than editorial statements.

Reprints—The publishers will communicate with authors regarding reprints upon publication of paper.

Communications—Contributed articles, illustrations, letters, books for review, and all other matter pertaining to the editorial department should be addressed to the Editor, Dr. H. C. Pollock, 4482 Washington Blvd., St. Louis, Mo. All communications in regard to advertising, subscriptions, change of address, etc., should be addressed to the publishers, The C. V. Mosby Company, 3523-25 Pine Blvd., St. Louis, Mo.

Illustrations—Such half-tones and zinc etchings as in the judgment of the editor are necessary to illustrate articles will be furnished when photographs or drawings are supplied by the authors of said articles.

Advertisements—Objectionable advertisements will not be accepted for publication in this Journal. Forms close first of month preceding date of issue. Advertising rates and sizes on application.

Change of Address—The publishers should be advised of change of subscriber's address about fifteen days before date of issue with both new and old addresses given.

Nonreceipt of Copies—Complaints for nonreceipt of copies or requests for extra numbers must be received on or before the fifteenth of the month of publication; otherwise the supply may be exhausted.

Entered at the Post Office at St. Louis, Mo., as Second-Class Matter
Additional Entry at Fulton, Mo.

EDITORIALS

The Next Orthodontic Leadership

UPON the professional stage of action things are changing rapidly, as are all things at this time. Concepts orthodontic are changing as well, and it is interesting to interview the younger men in the orthodontic field of endeavor to learn, to know and to survey their attitude toward the general or whole picture of their profession. They represent the new thought, the recent approach to the subject. They mentally reflect a new—or perhaps a better adjective than new would be great, big or broad—picture of the subject as contrasted to the mechanical or applied epoch of twenty years past.

XUM

A young man of ten years' experience in orthodontia, a graduate of an eminently well-known postgraduate school course of eight weeks' duration, a man who has availed himself of every short postgraduate course available to him in the past ten years, in other words a modern, well-trained and well-rounded-out orthodontist, was asked by this editor to write, in short and to the point, his concept of the status orthodontic of 1932. It will be interesting to our readers to know what he wrote. It follows:

"When one considers the vast amount of material which has been contributed to the science of orthodontia, thereby tracing the progress of this specialty to the present day, he realizes that the subject matter assumes formidable proportions.

"The initiate to the practice of orthodontia is confronted with a serious problem. Having just returned from a postgraduate course of instruction, consisting of several weeks of intensive study in the fundamentals of the science, with his mind full of systems of procedure, contradictory statements advanced by orthodontists, and an armamentarium of strange instruments, he is bewildered and seeks surcease from doubt and uncertainty in the literature on the subject. The contributions of the leaders of thought on the subject seem to be at variance with one another. What is he to do? Whom is he to follow? He must consider that authoritative statements as such, are nonexistent—their context may be altered by the state of the individual's physical, emotional and environmental fitness. The student should, instead, select from every available source of information some shreds of evidence which he can apply to his understanding of the subject. This, then, becomes the residuum of scientific information upon which he must depend, until, by dint of effort, clinical practice and observation, he can arrive at a method of procedure which is peculiarly adapted to his concept of the orthodontic problem.

"The International Journal of Orthodontia, Oral Surgery and Radiography has for seventeen years published the thoughts, writings and discussions of the leading contributors of the time, and when one thumbs the various editions of this publication, he is impressed with the fact that no one man or system can be followed or accepted literally. However, there are formulas advanced by some of the older scientists which, by reason of strict investigation and years of successful application, have become accepted as fact.

"The student must turn to the study of natural and biological phenomena for an answer to his problem. The masticatory mechanism is not to be considered as a separate organism but as one of an aggregation of organs, all interdependent and subject to the same laws of growth and development as the organism as a whole. Physical and biological laws do not necessarily coincide. In spite of the so-called axioms of treatment advanced by our scientific literateurs, we cannot lose sight of the fact that certain developmental phenomena are misconstrued, are treated as anomalies and the results obtained are occasionally satisfactory, in spite of the appliances used. Upon close observation, it will be found that a number of these cases would have matured properly if allowed to go on unmolested by mechanical contrivances. Again, many cases are discharged as treated long before the necessary age

XUM

of maturity, only to have them return, years later, relapsed. This sad affair, in many cases, is responsible for the denouncement of the system of treatment used, and marks the birth of a new one.

"It follows then, that clinical experience becomes one of the best instruments at our disposal. Conventions of orthodontists, orthodontic literature and conversations with other men in the field all serve their purpose, since it enables the student to evaluate the current thought on the subject and apply it to his best advantage.

"The beginner in orthodontia is the scientist of tomorrow, and long after the present authorities have passed to their just desserts, he must carry the banner, and by understanding that his patients are just as human and living as himself, be able, perhaps, to approach the solution of the orthodontic problem."

If the above train of thought reflects the attitude of many of the younger men in orthodontia, it is plainly obvious that orthodontia as a science is destined for far greater progress than it has enjoyed in the past, that the pioneering days are passing, along with so-called mechanical systems in orthodontia. This Journal believes the thoughts reflected in this young man's words are for progress in orthodontia as a science.

H. C. P.

Delegates

DELEGATES to dental and medical conventions fall into two groups: those who seek and those who are sought. In the first class belong the politicians in dentistry and medicine, and they are legion. In the second class belong the dentist and physician who do not seek political preferment, but upon whose shoulders is placed by their colleagues, the political leadership of the local society.

State and national dental and medical conventions are made up of these two types of delegates. Let it be said in passing that it is no easy task to successfully carry out the obligation of a delegate to conventions. If one does nothing at such meetings or if there is nothing but routine work to be done, then being a delegate is nothing more than a rubber stamp signature to a circular letter. But, on the other hand, let important measures be pending, measures that mean much either in developing or retarding dentistry or medicine, and the picture changes materially. Then as a delegate one has responsibilities to carry.

It would be well if members of local and state dental and medical societies could be made to realize that there are obligations connected with allowing oneself to assume the duties of being a delegate to such conventions. Becoming "delegate minded," as it were, would be of great benefit to both dentistry and medicine. A realization of the seriousness of such obligations would make delegates take up their duties with a feeling of responsibility, and not with the feeling so much in evidence now that it affords an opportunity of airing some personal grievance or putting over some pet idea.

XUM

Furthermore, this feeling of serious responsibility would cause delegates to state and national dental and medical conventions to attend more of the business meetings of such societies and see to it themselves that legislation of questionable type is not passed if they themselves can prevent it.

State and national dental and medical meetings are held for the purpose of bettering dentistry and medicine, not for the purpose of pleasure or political profit.

H. C. P.

XUM

NEWS AND NOTES

Southern Society of Orthodontists

Plans for the Southern Society of Orthodontists meeting, which will be held in Knoxville on October 31st, November 1st and 2nd are going forward beyond expectations. There is no reason to doubt the fact that it will be an exceptional meeting from the standpoint of Essayists and Clinicians and from the point of attendance.

The different subjects cannot be announced at this time, but we have the acceptances of the following Essayists:

W. W. Woodbury, Halifax, Nova Scotia
B. H. Broadbent, Cleveland, Ohio
Hugh Hatfield, Boston, Massachusetts
Milo Hellman, New York City
Leroy Johnson, New York City

The following Clinics will be given:

"Fracture Splint for Simple or Multiple Fractures of the Mandible or Maxilla Practical and of Easy Construction by the Orthodontist," Harry E. Kelsey, Baltimore, Md.

"Space Retainers," Gerard A. Devlin, Newark, N. J.

"Impacted Lower Canine," A. S. Bumgardner, Charlotte, N. C.

"Mouth Breathing Cases Treated With the Pollock Appliance," Harry G. Jones, Indianapolis, Ind.

"Labial and Lingual Arches, Using Coil Springs," V. A. Stilley, Jr., Paducah, Ky.

"Treatment of Deep Overbite With Cast Gold Biteplane," Harry C. Metz, Pittsburgh, Penn.

"An Economical Ribbon Arch," Roy D. Mitchell, Atlanta, Ga.

"Space Retainers," Frederick W. Black, Cincinnati, Ohio.

"Some Uses of the Auxiliary Spring," E. W. Patton, Birmingham, Ala.

"Willett Cast Overlay Technic," Harvey G. Bean, Toronto 5, Canada.

"Treatment," Andrew F. Jackson, Philadelphia, Penn.

"The Balanced Reciprocal Arch," Norris C. Leonard, Baltimore, Md.

"Some Uses of Coil Springs," W. K. Slater, Knoxville, Tenn.

"A Combination Treatment and Retaining Appliance," H. C. Shotwell, Lynchburg, Va.

"Taking Impression to Change Lingual Appliance Without Removing Bands," Winston P. Caine, Chattanooga, Tenn.

"The Possibilities of Correcting Malocclusion Where Loss of Opposing Teeth Has Resulted in Elongation," W. E. Lundy, Memphis, Tenn.

"The Guide Plane," Oren A. Oliver, Nashville, Tenn.

"Method of Preserving Anchorage Position While Readjusting Lingual Arch," C. F. Bowles, Richmond, Va.

Group Clinics, Florida Study Club.

Several other clinics will be secured before the meeting. Members of other Orthodontic Societies who are planning to attend the meeting and have something of merit which they wish to contribute are requested to get in touch with the Program Committee of which C. C. Howard, Doctors Building, Atlanta, Georgia, is chairman.

XUM

We take this opportunity of extending a most cordial invitation to all ethical practitioners of Orthodontia and Dentistry.

CLAUDE R. WOOD, *President*,
608 Medical Arts Bldg.,
Knoxville, Tenn.

GEORGE M. ANDERSON, *Secretary*,
831 Park Ave.,
Baltimore, Md.

Association of American Women Dentists

The Eleventh Annual Meeting of the Association of American Women Dentists will be held at the Statler Hotel, Buffalo, New York, on September 12 at 2 P.M. Banquet at 6:30 P.M.

GENEVA E. GROTH, Chairman Publicity
Committee,
1301 Medical Arts Bldg.,
Philadelphia, Pa.

International Dental Federation (F. D. I.)

Communications have been published in the papers concerning a prize competition of the Fédération Dentaire Internationale, stating that this competition would involve the torture of animals on a large scale, we therefore request you to be good enough to insert the following.

At the International Dental Congress, held in August, 1931, in Paris, one of the seventeen Sections expressed the wish that a prize competition should be inaugurated in order to solve the problem of the treatment of infected root canals, a septic condition, which, as is well known, may be the cause of a number of serious chronic diseases.

This request has been referred to the Executive Council of the International Dental Federation, constituted by the representatives of 43 affiliated countries, which will consider the question at the session which takes place in August at Zurich.

This prize competition has evoked a flood of protests, because of the misconception that it entailed the torture of a large number of animals.

To those who know the preparatory work which has been done by the Scientific Commission and which has led up to this competition, any idea that these experiments could be undertaken by the ordinary physician or dentist, is quite absurd. The ordinary practitioner has neither the knowledge nor the facilities at his command which are necessary to comply with the humanitarian and scientific safeguards which will be required.

In reality, these experiments can only be carried out at a few university centers.

The Bureau of the International Dental Federation carefully considered the whole question at a meeting held at The Hague a few days ago, and in order to remove the misconceptions which have arisen, will propose that the following stipulation be inserted:

No experiments will be considered to have complied with the stipulations of the competition unless they are carried out in the scientific laboratory of a recognized university.

The International Dental Federation will, when the time comes, publish the names of these universities.

G. VILLAIN, President,
Paris,
CH. F. L. NORD, Secretary General,
The Hague.

XUM

The American Society for the Advancement of General Anesthesia in Dentistry

The scientific program for the season of 1932-1933 of the American Society for the Advancement of General Anesthesia in Dentistry will commence on Monday evening, October 24, at the New York Physicians Club, 133 E. 58th Street (corner of Lexington Avenue), New York City.

The meeting will open with a dinner at 7 P.M., and the scientific session at 8:15 P.M. Dr. James R. Cameron of Philadelphia, Pa., will read a paper entitled "The Control of Emergencies arising during General Anesthesia." Discussion will be opened by Dr. Robert A. Robinson of Albany, N. Y.

Membership in this organization is available to members of the American Dental Association and American Medical Association, and registered nurses or scientists interested in the field of anesthesia.

Officers for the ensuing year are:

JAMES TAYLOE GWATHMEY, M.D., Honorary President,
133 E. 58th Street,
New York City.

M. HILLEL FELDMAN, D.D.S., President,
730 Fifth Avenue,
New York City.

LEONARD S. MORVAY, D.D.S., Secretary and Treasurer,
76 Clinton Ave.,
Newark, N. J.

Greater New York December Meeting

The eighth annual Greater New York December Meeting will be held at the Hotel Pennsylvania, New York City, December 5-9, 1932.

This meeting is held under the auspices of the First and Second District Dental Societies.

The program is being developed with the idea of devoting more than the usual amount of attention to the things that count for efficiency in the everyday practice of our profession.

CARROLL B. WHITCOMB, Chairman.

Sixty-Seventh Annual Meeting of Ohio State Dental Society

The Ohio State Dental Society will hold its 1932 meeting in Cleveland on December 5, 6, and 7. Arrangements are being made for a program by outstanding men in the various specialties of dentistry. The program will be divided into the four sections of dentistry, and the four sections will be in session at one time, thus insuring a maximum diversity of choice in the type of program.

EDWARD C. MILLS, Secretary,
255 East Broad Street,
Columbus, Ohio.

American Society of Oral Surgeons and Exodontists

The fourteenth annual meeting of the American Society of Oral Surgeons and Exodontists will be held in Buffalo, N. Y., at the Hotel Buffalo, September 9 and 10, 1932.

E. W. BROWNING, President,
921 Boston Building,
Salt Lake City, Utah.

HARRY BEAR, Secretary,
410 Professional Building,
Richmond, Va.

XUM

American Dental Assistants Association

The Lafayette Hotel has been designated as headquarters for the eighth annual meeting of the American Dental Assistants Association which will be held in Buffalo, N. Y., September 12-15, 1932. For further information address

RUTH M. CLARK, General Secretary,
Suite 1-4, Seofield Building,
Minot, North Dakota.

American Congress of Physical Therapy Section on Stomatology

The eleventh annual scientific session of the American Congress of Physical Therapy will be held at the Hotel New Yorker, New York City, September 6-9, 1932. A section on stomatology has been organized, and on September 9 a full day's program will be offered in this specialty.

The Society of Plastic and Reconstructive Surgery

The Society of Plastic and Reconstructive Surgery held its first scientific meeting June 3, at the New York Academy of Medicine, New York City. The first annual meeting of the society will be held on October 28 and 29, 1932, at the New York Academy of Medicine.

GASTON LABAT, General Secretary,
30 E. 40th Street,
New York City, N. Y.

Items of Interest

Drs. Ira Burton Stilson and William Franklin Harrison announce the removal of their offices to 5 Euclid Avenue, Providence, Rhode Island. Practice limited to orthodontia.

XUM